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AUGUST-SEPTEMBER

1959

VOLUME 52 NUMBER 7

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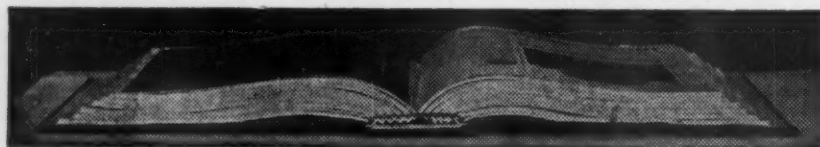
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Nature Magazine

AUGUST-SEPTEMBER, 1959 VOL. 52 NO. 7

Published by the **AMERICAN NATURE ASSOCIATION** to stimulate public interest in every phase of nature and the out-of-doors, and devoted to the practical conservation of the great natural resources of America

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Reviews

Principles of Field Biology and Ecology

By Allen H. Benton and William E. Werner, Jr. New York. 1958. McGraw-Hill Book Company. 341 pages. Illustrated. \$6.50.

"Ecology is the more cultured offspring of the old natural history; indeed, one well-known ecologist... has called ecology 'the new natural history.'" With this acknowledgement, the writers have produced a book that successfully bridges the gap between the esthetic and fascinating field of natural history and the disciplined, scientific study of ecology. "What, why and how," although a chapter heading, is the keynote in their presentation. The book is designed as a textbook for a student in a beginning field biology course. Its highly readable style, and remarkable and up-to-date compilation of material in such fields as biological succession, population dynamics and behavior study, will make it especially useful to amateur naturalists who are interested in a more mature approach to their studies. The special plea of the authors is: "The well-trained biologist, whether amateur or professional, needs to understand the principles and scope of biology as a whole." Here is a unique book, with many refreshingly new photographs, that admirably fills this bill.

ROMEO MANSUETI

The Vertebrate Story

By Alfred Sherwood Romer. Chicago. 1959. University of Chicago Press. 437 pages. Illustrated. \$7.00.

For more than a quarter-century Alfred Sherwood Romer's *Man and the Vertebrates* has enjoyed popularity as a text and reference work. With the passing of the years it became apparent that a revision was necessary and the author felt that it should be a radical one. Thus the changes made certainly justify retitling this excellent book on the vertebrates. While it is, or will be, we are sure, popular as a textbook, it is a work that has wider appeal, thanks to the author's style, which is more sprightly than that usually found in texts. Some eighty new photographs are included in this book, and the bibliography is brought up to date through the inclusion of recent publications of value.

Enjoying Birds in Michigan

Edited by Haven H. Spencer. Jackson, Michigan. 1959. Michigan Audubon Society, 7165 Bunkerhill Road. 64 pages. Illustrated. \$1.29.

This is a second, revised and enlarged edition of this useful guide and resource book valuable to Michiganers and to Nature enthusiasts visiting this naturalistically richly endowed State. This paper-bound book is published to aid in finding, attracting and studying the birds of Michigan.

The Challenge of Science Education

Edited by Joseph S. Roucek. New York. 1959. Philosophical Library. 491 pages. \$10.00.

This is an extremely interesting and timely book at a time when science is riding high in the educational saddle and given often extravagant credit for solution of all, or most, of the problems that beset mankind. In an excellent introductory chapter the editor, who is on the faculty of the University of Bridgeport, Connecticut, traces the development of science down to the appearance of modern science, its marriage to technology and the impact of this union on philosophy, theology and social relationships. In a second chapter, under a division heading of "The Framework," William W. Cooley of Harvard discusses the national welfare and science education. A second division is en-

titled "Background" and John H. Woodburn of Johns Hopkins writes on the history of science education and Mehdi Nakosteen of the University of Colorado on religion and scientific education. Considering the formal education aspects of science, Edwin F. Lange of Portland State College discusses science for general education. Responsibility for describing early education in this field is shared by Hanor A. Webb of George Peabody College for Teachers and W. W. Sawyer of Wesleyan University (Conn.). Space does not permit listing all of the collaborators, who discuss secondary education, college and university education in science, and others who concern themselves with auxiliary and comparative aspects of the subject. Not only can this book be profitably read by anyone concerned intimately with science education as a teacher or administrator, but it is also of value to anyone willing to think seriously about this vitally important intellectual area.

Briefly Noted

The Book of Nature. By Arien Sluys. New York. 1959. Vantage Press. 239 pages. \$3.95. The author presents a new concept of Creation, asserting that we live in a spiral cosmos.

The New Science. New York. 1959. Meridian Books. 328 pages. \$5.00. Three complete works of Max Planck, originator of the quantum theory.

The new 2nd Edition

PRINCIPLES OF BIOCHEMISTRY

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THIS new second edition is an exceptionally modern, well-balanced presentation, emphasizing the fundamental principles and concepts of biochemistry. Particular consideration is accorded to the mechanisms of, and factors influencing, the biological reactions where they are known.

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Nature IN PRINT

By HOWARD ZAHNISER

Wilderness High Worlds

NOT LONG AGO A FOLDING BROCHURE came in the mail advertising in advance of publication "a book to match our mountains," presenting examples of photographs in color and black and white—from the Superior Publishing Company, P.O. Box 2190, Seattle 11, Washington. The photographs were by Bob and Ira Spring, who also had illustrated two other books featured in this brochure. Of Bob and Ira Spring—twins—I had heard much in the Northwest and here and there had seen evidences in photography. Of course I ordered the books. They arrived, with their pictures of snow and ice, in the midst of Washington, D. C.'s late June heat and humidity. Lacking indexes and lists of photographs, they all (fortunately or unfortunately) demanded examination throughout at once. As a result, they were read through, in two successive evenings. They were indeed welcome, and they well met expectations.

High Worlds of the Mountain Climber is the newly published volume, but the earliest was the 1951 volume called *High Adventure*. The third was a 1955 "cameralog," about camera adventuring on Mt. Rainier, number one in a "Northwest Adventure Series" that also now includes publications on Puget Sound, the Columbia, and Oregon. So after the first curious examination I read them in the order of their chronology.

It was well that I did, for *High Adventure* is not only a presentation of mountain photographs, on pages about the size of this magazine. It also is a vivid and intimate introduction to these twin photographers, an interpretation of their mountaineering and photography, and a description of mountain climbing experiences and appreciations—in an excellent and good-humored text by their wives Norma and Patricia, writing in collaboration.

Wifely collaboration

"Bob and Ira call us their 'model wives,'" they tell us, "shot' along

with other fantastic shapes—among the icefalls to indicate comparative size." As model wives they also are camp cooks, dishwashers, wood gatherers, and secretaries. And they "come in handy when the boys are trying to convince a dubious model to pose in a spectacular place."

"Move over a little closer to the edge," they shout, "There's nothing to it—Pat and Norma are already there."

Add to these intimacies the interest in a baby and a two-year-old whose "go-go-go" mountain travel is mostly in his regular car seat lashed securely to his mother's packboard; the interest in the domesticities of base camp, high camp, and the general management of living on climbing expeditions; and the fascination of mountain climbers, especially those who scale the cliffs and slide down ropes dangling over abysses—add all these and this text of *High Adventure* has indeed a wealth of human interest.

The photographs of *High Adventure*—for which Bob and Ira Spring add a 3-page tabulation, picture by picture, of technical data—are a presentation not so much of scenery but of climbers in their setting. There are, of course, examples of the magnificent views that climbers achieve. Most of these photographs are of Mt. Rainier scenes, but Mt. Olympus, Mt. Baker, and other mountains in the Northwest are also represented, and some of the most striking are of Glacier Peak in the North Cascades—a mountain of special interest now because of national-park and wilderness-area proposals for protecting its magnificence and the forested valleys and high country surrounding it.

Norma and Patricia Spring have also written the text for the "cameralog" entitled *Mt. Rainier: A Washington Camera Adventure by Bob and Ira Spring*, a brief but simple and clear guide to "The Mountain That Was God," including a map. This is a paper-bound hand-size volume supplied in a gift box with the same photograph in color that is on the

front cover. Three photographs in the book are in color but the others are black and white. "Bob's and Ira's Notes on Photography" is the title of a chapter that includes a picture tabulation of "Photographer's Technical Data." Other chapters deal with flowers, animals, climbing, and special features of Mt. Rainier. An enticing volume for refreshment on a hot humid evening near the Potomac, it obviously is most useful as one gets close to Mt. Rainier.

Splendid photography

Finally one comes to the 1959 volume *High Worlds of the Mountain Climber*. In it not only the frontispiece but four other full-page photographs and a two-page spread are in color. The photographs of the volume are again most distinctively of the Northwest, but as the climbers of the Northwest venture into Canada, California, Colorado, and other far places, so *High Worlds* includes Yosemite, Mount St. Elias, Long's Peak, and Teton photographs. A concluding group, "The Wilderness Cascades," again features the northern Cascades.

Harvey Manning, himself a mountain climber, a member of the Seattle Mountaineers who has edited the club's bulletin, is the author of a text that is rich not only in description but also in its historical perspectives and its appreciations—not only of mountaineering experiences but of the importance of the wilderness preservation that helps insure mountaineering in the future.

In one of the volume's opening paragraphs Mr. Manning exults in the thought that "once a person has been startled by the brightness of stars, or even frightened by the realization that they are points of fire in a space that extends around and below as well as above the world, once he has stood in the sunshine on a rock summit above an ocean of moving clouds, he can never again be entirely sane by standards of the low world, nor will he ever want to be." He also realizes that "the distinctive pleasure in American mountaineering is that many of the peaks rise above a wilderness as yet little damaged by a century of civilization," and that it is important to keep some areas thus undamaged. The very last sentence of his text holds out the hope:

"If the present generation wills it so, the hiker and climber of a century from now may very well

recognize in many of this book's photographs the unchanged wilderness of their own vacations."

In an eloquent three-paragraph preface that occupies a page opposite the breath-taking color photograph of two mountaineers preparing to rappel from the Lost Arrow in Yosemite Valley, Supreme Court Justice William O. Douglas relates such a volume as *High Worlds* to our current and national concerns for human welfare.

"Not all the steel, concrete and asphalt, no degree of ingenuity with electronics and the atom, no man-made inventions can duplicate the wonders of the wilderness," concludes the Justice. "We must unite," he urges, "to save the tiny islands of true wildness that we have left. If we destroy them, we will have lost forever some of the true glory that was America."

It is an achievement of Bob and Ira Spring that they have revealed in photographs so much of the mountain glory of this precious American wilderness.

High Adventure. Mountain Photography by Bob and Ira Spring. Text by Norma and Patricia Spring. Superior Publishing Co., P.O. Box 2190, Seattle, 11, Wash. 1951. 116 pp. (9-3/8 x 12-1/4 in.), with frontispiece in color, 142 photographs in black and white, and tabulation of "Technical Data to the Pictures." \$8.50.

High Worlds of the Mountain Climber. Mountain photography by Bob and Ira Spring. Text by Harvey Manning. Seattle: Superior Publishing Co. 1959. 143 pp. (8-3/8 by 10-5/8 in.), with 6 photographs in color and 101 in black and white and preface by William O. Douglas. \$10.

Mt. Rainier: A Washington Camera Adventure. By Bob and Ira Spring. Text by Norma and Patricia Spring. Seattle: Superior Publishing Co. 1955. 72 unnumbered pages (6 1/2 by 9 in.), with endpapers map, 3 photographs in color and 73 in black and white, and tabulation of "Photographers' Technical Data." \$2.25 in paper back and gift box. 📷 📷 📷

Two Little Savages

By Ernest Thompson Seton. New York. 1959. Doubleday and Company. 410 pages and index. Marginal illustrations by the author. \$3.95.

Longer ago than we like to contemplate we were an enthralled

young reader of this book, which was first published in 1903. We suspect that its publication in a new edition will awaken memories among many whose years are more or less contemporaneous with our own. We have never forgotten the two young heroes of this story of the outdoors—Sam and Yan, the latter being Seton himself. We can recall that our grandmother made for us an Indian suit with red fringe along the arm and leg seams, and we recall that we, with two or three of our young cohorts, tried to emulate the outdoor experiences of the two little savages. Indeed, the first edition inspired the formation of many groups of young people. Although a copy of the first edition was long in our library as a boy, it strayed somewhere during the years, but the new edition will be preserved for the reading of our three grandsons—that is, after their grandfather has reread it. R.W.W.

River World

By Virginia S. Eifert. New York. 1959. Dodd, Mead and Company. 271 pages. Illustrations by the author. \$4.00.

Virginia Eifert has come to know the Mississippi intimately, from its headwaters, near which she has summered, to its mouth, to which she has traveled by riverboat. Her acquaintance has been further enriched in the course of writing her five books about Abraham Lincoln and his family. An able naturalist, she appears to have saved for last her story of the wildlife of the great river, for this book is subtitled "Wildlife of the Mississippi." She says that the wild creatures living on, above, in or beside the river "give the river its true personality, characterizing it as much as the color, the clarity or the potent murkiness of the waters, or the shores of its several life zones." Here is a delightful book, charmingly and informatively written.

Briefly Noted

Who's Running this Exposition. By Ruth Baus. New York. 1959. Coward-McCann. 256 pages. \$4.00. Misadventures of a California ex-housewife in the jungles of Central America.

The Ghost of North America. By Bruce S. Wright. New York. 1959. Vantage Press. 140 pages. Illustrated. \$3.50. The story of the eastern panther.

The Upper Atmosphere. By H. S. W. Massey and R. L. F. Boyd. New York. 1959. Philosophical Library. Illustrated. \$17.50. Presentation of what is known today about the upper atmosphere as studied during the International Geophysical year.

The Nature of Things. By Don Hawley. New York. 1959. Philosophical Library. 186 pages. \$3.75. The author views the nature of all things as a Spiritual-material continuum.

My Best Friends Are Apes. By Heinrich Oberjohann. New York. 1959. E. P. Dutton & Co. 191 pages. Illustrated. \$2.95. Entertaining report of personal experiences with apes in their natural habitat.

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Reviews

Water Street U.S.A.

By William H. Carr. Tucson, Arizona. 1959. *Arizona-Sonora Desert Museum and The Charles Lathrop Pack Forestry Foundation*. 65 pages. Illustrated. Fifty cents.

This is a description of a truly unique creation conceived by the author and brought into being under his direction. This is the Watershed Exposition, now a fascinating part of the fine Arizona-Sonora Desert Museum, one of the leading attractions of this area. As Arthur N. Pack, president of the Museum, says in a foreword: "It is a new experiment in visual, tactile, and audio approach to outdoor education with implications far beyond the immediate teaching aims of the Exposition itself." Although the Exposition really has "to be seen to be appreciated," Mr. Carr, through word and picture, presents the story told by the various parts of the exhibit. He quotes the labels that are found before each exhibit and then describes the exhibits and the part of the water story they set forth. The story is not confined to the water problems of the Southwest alone, since comparable water situations exist elsewhere. However, the emphasis is on what happens to water in a region where it is not in plenty and where conservation of water is essential. No visitor to the Tucson area should miss the Museum and the Watershed Exposition, but until this is possible Mr. Carr's description is the next best thing.

Fruit Key and Twig Key

By William M. Harlow. New York. 1959. Dover Publications. 56 pages. Illustrated. Paper-bound. \$1.25.

This is a key to the identification of trees of the Northeast by their fruit and the deciduous woody plants of eastern North America by their twigs. This brings together two separate publications that have enjoyed wide popularity and use. The result is a happy botanical wedding.

Briefly Noted

The Game Warden and the Poachers. By Lewis C. Reiman. Ann Arbor, Michigan. 1959. Northwoods Publishers, 1725 Landsdowne Road. 196 pages. \$3.95. First-hand accounts of game law violation and apprehension of the violators in Michigan.



Robert B. McCoy

AUG.-SEPT. CONTRIBUTORS

John Lindsey Blackford, writer-naturalist and photographer of Libby, Montana, article writer who finds much of his story material in the true "back country" of the American West, takes our readers into typical Blackford territory this month in quest of one of his favorite topics, bird life. . . Percy L. DePuy, born on a farm in southeastern Kansas, is a graduate of Kansas State College (now Kansas State University)



Percy L. DePuy

where he specialized in zoology and botany. He has variously been biologist with the old U. S. Biological Survey—now the Fish and Wildlife Service—and the Soil Conservation Service, manager of Squaw Creek National Wildlife Refuge in Missouri, teacher at Kansas State University, and free lance writer of articles and stories on nature subjects. . . Peggy Larson, resident of Tucson, Arizona, is the writer-wife of the curator of exhibits at the Arizona-Sonora Desert Museum near that city. . . Millard C. Davis, a recent graduate of Cornell University with a degree in entomology, is presently a biology teacher at Blair Academy in Blairstown, New Jersey. . . Robert B. McCoy, formerly an editor with a Chicago magazine group, is now a free-lance article writer and photographer, and an ardent national park and wilderness enthusiast. . . Philip Brady, of Needham Heights, Massachusetts, conducts a copy and planning service for advertising, public relations, and editorial requirements. . . Weldon D. Woodson, a professional magazine and newspaper writer with more than 1300 full length articles to his credit, is a resident of Alhambra, California. . . Blanche S. McKnight is a Floridian by birth and education, but lived for 36 years in Washington, D. C., where she wrote extensively. Since returning to Deland, Florida, she has continued to free-lance. She is a member of the American Newspaper Women's Club. . . William S. Pierson, vocationally a sales representative for a coffee concern, has had a number of spare-time articles on outdoors subjects published in the past few years. Mr. Pierson is a resident of San Mateo, California.

Mr. Wizard's Experiments for Young Scientists. By Don Herbert. New York. 1959. Doubleday and Co. 187 pages. Illustrated. \$2.95. Thirteen science projects described in detail.

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trated. \$3.00. The fourth in a series of coastal studies.

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Training the Hunting Retriever. By Thomas R. Cofield. Princeton, N. J. 1959. D. Van Nostrand Co. 138 pages. Illustrated. \$4.75. Covers the Labrador, Chesapeake and Golden.

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Noted

BY THE EDITOR

DROUGHT IN MIGRATORY WATERFOWL BREEDING AREAS in the early thirties brought the numbers of these birds to a perilous low. So serious was the situation that "Ding" Darling, Chief of the then U. S. Bureau of Biological Survey, declared that if we did the best thing for the ducks there would be a closed season. However, he said, such a season would deprive the States of license revenue, cancel the income from the then one dollar duck stamp, and be an economic blow to many in depression times. So a restricted season and bag were proclaimed, and Nature cooperated by breaking the drought. Now, reports Dan Janzen, Director of the Bureau of Sport Fisheries and Wildlife, we are confronted by a similar situation. Fifty to eighty percent of the potholes in the great breeding areas of Canada and the two Dakotas have dried up in the drought, or have been lost by drainage of wetlands to make agricultural land we do not now need. He warns that the duck hunting prospects for this fall "look pretty grim." And again the revenue from the now three dollar duck stamp is involved. All of the income from this source, beyond the cost of printing and distributing the stamp, is earmarked for acquisition of wetlands. This would scuttle the vital program. Mr. Janzen urges duck hunters to regard the purchase of the duck stamp as insurance for the future of the resource, and asks purchase of the stamp even in the face of severe restrictions on duck hunting. We have never shot a duck but we will buy a stamp this year as a contribution to the future of our migratory waterfowl, and we urge other non-hunters interested in these birds to do likewise.

"THE IRRESPONSIBLE POISONERS" is the title of an important article by Robert L. Rudd in the May 30, 1959, issue of *The Nation*. Dr. Rudd is a member of the Zoology Department of the University of California, and, as an able and informed biologist, he addresses himself to the dire effects on wildlife of pesticides and such lethal poisons as Compound 1080. He declares that inertia and entrenched ideas must be overcome in solving this problem, and he identifies four major weaknesses in the present approach. First Dr. Rudd lists as "the unrepresented," the army of people interested recreationally in the outdoors, and charges State and Federal agencies with failure to speak with wisdom and vigor in behalf of those outdoor interests for which they speak. A second weakness is listed as "approved and recommended" and cites the results of the stamp of officialdom on the economic poisons as a serious factor in failing to

face up to the situation. "Short-sightedness, political expediency, simple apathy and biological ignorance play too big a role in our pest-control programs," asserts Dr. Rudd. Next comes "the channelized thinker," the individual whose biological training and thinking is in one narrow channel, and who, being employed by government or industry, find himself "in a mental straight jacket." Finally, Dr. Rudd cites "the production fetish," which justifies the poison programs because they increase production at a time when "overproduction has settled upon us like a plague." We wish more biologists would throw off the shackles of channeled thinking and bureaucratic domination and tell the truth about the violence poisons are doing to our ecology, and, we are firmly convinced, inevitably to human physical well-being.

ANENT THE BILLBOARD MAN'S CLAIM TO CERTAIN "RIGHTS," let us ponder the following paragraph by Ralph Waldo Emerson: "Miller owns this field, Locke that, and Manning the woodland beyond. *But none of them owns the landscape.* There is a property in the horizon which no man has but he whose eye can integrate all the parts; that is, the poet. This is the best part of these men's farms, yet to this their warranty-deeds give no title." The italics are ours.

COMPULSORY TRAINING IN FIREARMS USE is provided in a bill introduced in the Wisconsin Legislature and, apparently, endorsed by the State Conservation Commission, using as its reason involvement of a significant percentage of teen-agers in hunting accidents. Similar moves have been made elsewhere, seeking to add firearms proficiency to the school curriculum. One of the Departments of the National Education Association has given its blessing to this activity, and it has turned up in the policies of youth groups. The National Rifle Association is supporting such programs on grounds of safety, and the arms and ammunition manufacturers are, naturally, delighted. At the same time there are moves to restrict the ownership of firearms on the ground that it would do away with gangsters and hoodlums. In our opinion there is some mighty turgid thinking involved in both of these proposals. While we heartily agree that no teen-ager should go into the hunting field without realization that he is carrying a lethal instrument and must be responsible in its use, we do not believe that *every* teen-ager should be trained to be a hunter of wild animal life. Our wildlife that is classed as "game" is today subjected to more pressures of hunting, habitat destruction and expansion of human development than they can long stand. On the other hand prohibition of firearms, or complicated restrictions, will never meet the problem of gangsterism. If a hoodlum wants a gun he will get one, even if he has to make it himself. There are specious arguments voiced in support of both these ideas. Indeed, they are just as specious as the totalitarianism with which they are both strongly scented.

R. W. W.



Outlined against a dawn sky are the monuments and sentinel rocks of Monument Valley, in Utah and Arizona, where the prairie falcon, rock wren and Say's phoebe nest on cliff ledge, rimrock and desert butte.

As a Navajo, his lean figure clad in tight levis and jacket, his long black hair coiled beneath an increased ten-gallon sombrero, motioned ahead toward tall sentinel rocks standing on the drifted floor of Monument Valley, I recognized the stony gate in which we stood. Between Arches and Moki Mesa, near the Utah-Arizona line, towering, thousand-foot walls lifted vertically on either side. Once I had clung to the high rim above, watching a spotted owl drop in steep-pitched, banking wing-slide into these depths. Now we gazed up to equally precipitous heights.

Only a few hours later I was to recall that surprising winged discovery, glimpsed so tantalizingly in this wilderness of stone. For, as we plodded on from the Indian's hogan through the tiring sands to photograph the story of Turkey Rock—a great rock-slab picture record of prehistoric hunting, dominated by an immensely tall, long-legged, crane-like bird with the breast beard of a wild gobbler—my Navajo friend spoke vaguely of the standing antelope of still another rock-writing. Years before, an undescribed avian had directed him to the strange picture-petroglyphs of "Owl Ledge," a secret of the Valley to

which he had never returned, but which we now sought.

Leaving the turkey hunt far behind, we found picture-writing—a double file of geometrical figures raising zig-zag tails above long, flat backs, tossing wide-curved horns symmetrically along a towering wall. It marked a great fracture plane, as precipitously and evenly cleft as if a mammoth saw had vertically sliced the mesa side. Only a single, low-level shelf, barely wide enough to

Strongholds of Rock

rest upon, interrupted the sheer cliff face. Ancient artists had perched there to make picture medicine, and there I clung, striving to hang far enough out to achieve camera focus on their curious mural of the chase.

The ledge traced the cliff base at no more than twice the height of junipers of the Valley. But there were rocks below, and I risked the camera as well. I could not help but exclaim upon the marvel of the picture find,



Crossing the southern narrows of Flathead Lake in western Montana, the author and a companion were once caught in a fair-weather windstorm that indirectly led them to an avian "homesite" long remembered.

and my thoughts stirred the Navajo to words better left unspoken. "An owl brought me here," he suddenly divulged. "He came from far off there along the wall. I followed him to this shelf by the pointed rock we climbed. That is how I found it." So while only antelope parade across the sheer cut mesa face, it is to Owl Ledge I shall return.

It is not well directly to interrogate the Navajo.

By JOHN LINDSEY BLACKFORD

Photographs by the Author

When I was moved to do so, others stood nearby. Yet I did not know when I would see my friend again.

"What kind of owl led you to the ledge?" I urged. "Was he a spotted bird? How big did he look?" My usually obliging guide had no answer. Swiftly retreating into the stoicism of the primitive, he did not hear me. Nor did he ever tell by letter, which perhaps he alone among Hoskinini-Begay's un-Englished Navajo

could write, what bird it was; or by what name among them owls are known. This alone he left unanswered.

I should have understood. To the *Diné* this is a creature of that evil time, the night, and an evil bird as well. Do not owls give false warnings, and frequent the dreaded places of the dead? Plainly, I had erred. Now I know that at death bad Navajos turn into coyote, owl, or, perhaps, to crow!

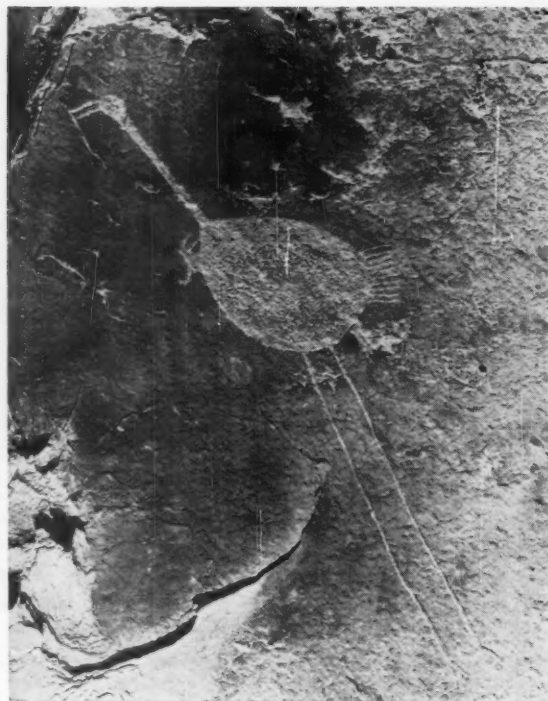
This, too, seems evident; it was the beautiful spotted owl that led my friend to that distant, memorable picture-ledge of Tsay-Begay, to Owl Ledge of Inside-the-Rock.

As we penetrate shadowed recesses and deep corridors in massive sandstones of the Colorado Plateau, or similar rocky fastnesses in a wide area of the West, a wild, free rondo comes tripping down the cliff face—the immeasurably delighting strain of the canyon wren. It is as if a silver chalice had been tipped to spill the runlet of crystal notes that cascade musically upon us. Searching upward for the source of the echoing melody, you catch the high, silvery gleam from flashing white throat as it swells with the ringing refrain; then discern the red-brown, mouse-like form



The graceful flight of violet-green swallows is familiar to all who have gazed into the sheer-walled stream canyons and mountain gorges of the West.

Turkey Rock, in Monument Valley, is a great rock-slab picture record of a prehistoric hunt, and is dominated by a tall, crane-like bird with the breast beard of a wild "gobbler."



creeping, flitting, slipping in and out of caves and crevices of the perpendicular, weathered rock.

The liquid lyric of the canyon chorister recalls the caress and stir of green leaf-fronds by hot winds in palm-thatched canyons; cool shadows in the deep, inviting rock; the blessed drip of water in remote oases where thirst has led, where beauty revives the soul. The magic canyon melody has greeted me in dim boulder-grottos of The Pinnacles in California's Coast Range. In Wyoming's desolate Wind River Gorge. In drab rock piles of the unnamed hills. Yet ever it held grateful tidings for the heart.

Life itself is like a canyon. We venture unknowing into some tortuous and forbidding defile. Dark, menacing waters rush beneath, their black depths waiting the unwary step or fearful footfall. We struggle on, hoping for that glimpse of brighter sky than admitted by the narrow, gloomy, leaning crags above. There is no return. The path before is indistinct; or often lost. We stand with precipice below and overhanging cliffs above. Then, unexpectedly, like the reviving song of the wren filling its canyon corridor, a bursting shaft of sunshine finds us. With renewed hope and strength we meet the challenge of life's threatening cliffs, and clamber out into the welcoming brilliance of the abyss' rim. The lift of a hand, or the message of a song has saved us. I love the canyon wren.

So varied are the rocklands—desert, mountain canyon, cliff and alpine crest, butte and badland, glacial moraine and talus slope—that among them all we find a diversified avian population. The number of winged inhabitants is nowhere great. No rocky habitat by itself provides adequate foraging. Only where vegetational communities are interspersed or broadly border on the barren, stony citadels do many rock-loving birds occur.

Such outcrop strongholds determine the distribution of

a number of avian forms. Wide-ranging hunters and aerial foragers seek cliff and precipice for security of nesting site, and find their living far afield. Others, making more limited demands upon their breeding territory, forage upon the shelving, grassy rimrocks, across flowering alpine meadows and over the wider treeless tundras of the heights—the "sky prairies" of the bleak, above-timberline plateaus. Rosy finches glean upon the glaciers, alpine snowfields, and jumbled rock moraines for wind-borne seed and insect. But like eagle and falcon, they, too, return to inaccessible cliffs for nesting.

Beneath darting metallic sheen of violet-green swallows in the Grand Canyon of the Yellowstone, one looks down painted slopes to observe in steep-pitched depths the bulky stick-nests of the ospreys. The security offered by many flat-topped spires that rise from these colorful

walls has led the great fish hawks to add their winged magnificence to the splendor of the gorge. Here they forsake solitary, tree-top nesting habits and gather at the rocky, canyon citadels. Upstream from Inspiration Point to the white, rising mist-veils of the plunging Lower Falls more than a score of the pinnacled nest-castles may be counted.

Major Bendire, one of the West's famed frontier naturalists, described the fortress safety of a river rock in his *Life Histories of North American Birds*: "The most picturesque nesting site of the Osprey I ever saw was located in the midst of the American Falls of Snake River, Idaho. Right on the very brink of these . . . the seething volume of water, confined here between frowning walls of basalt, was cleft in twain by a rocky obstruction which had so far withstood the ever eroding currents, and this was capped with a slender and fairly tapering column of rock rising directly out of the swirling and foaming whirlpool below. On the top of this natural monument, whose apex appeared to me to be scarcely two feet wide, a pair of Ospreys had placed their nest and were rearing their young amidst the never ceasing roar of the falls directly below. . ."

Over gale-swept alpine rock barrens slanting down from snow-streaked peaks and aretes, out on grassy, lichen-grown slide rock where pipits flock and fly, amid the stony, flower-strewn fields at timberline, white-tailed ptarmigan forage and roam. On bleak, boreal pumice slopes, across heathered tundras above tree-line, and upon the gleaming ice fields and snowbanks, they find their permanent home. Matching plumage to the rocks, the snow and the seasons, snow grouse survive all natural hazards of the heights. Their range, once well populated, extends south in the alpine-arctic zone along summits of the Rocky Mountains into New Mexico, and on peaks of the Cascades south of Mt. Rainier.

Sometimes the rocky strongholds guard secret nestings not commonly entrusted to their care. Years since, Winton Weydemeyer and I were caught in a fair-weather blow on Flathead Lake in western Montana. We began a crossing of the southern narrows as a strong swell worked up. Threading our outboard through rocky channel islands, holding in their lee, we approached perhaps the last strait keeping us from the farther shore. A spring gale now ripped across this open waterway, rolling leaping whitecaps in with full force from the big lake's southern bay, lashing the lake surface to a froth.

We ran down the long channel and drove into open lake waters in the teeth of the blow to skirt a rugged promontory that thrust its rocky headland out to meet the surf-girt isles. The stiff wind tore foaming crests from the waves and hurled a sheet of flying spray in our faces as we rounded the point. Then the motor cut out. The boat had stood well off the cape. There was time to snatch up paddles and swing the square-stern canoe about, ride down before the wind to the rocky, wave-lashed coast, and choose our landing.

"Looks like the boat's a gonner," I yelled, scanning the fast-approaching rocks. "Let's save the motor if we can."

But in seconds before we struck, narrow, shelving

Alpine peaks, precipitous cliffs, steep talus slopes and glacial relics like those of Moraine Lake in Alberta, below, are sought by the golden eagle, white-throated swift, rosy finch, and raven.



bedrock opened between jagged boulders. It was skirted by low, wind-twisted juniper. Up forward Weydemeyer leaped ashore and quickly hauled in the bow. Perched belt-deep on an underwater ledge as the boat pounded on her keel, I released the outboard and staggered with its seventy pounds after him. Three or four smashing waves swamped the broad-beamed canoe. But, struggling against them, we emptied the craft and worked it up beneath the little cedars. Fine weather to come with a blue sky!

The wind off the snow-capped ranges grew chill. Rather than stay on through the night, we explored the coast to determine whether it was headland or island. Soon, as we clambered among the broken promontory hills, vertical cliffs and sharp offshore rocks were seen to bound the heaving lake. Striving while we pushed



In the palm-pillared barrancas of Southern California's Santa Rosa Mountains, the author escaped from withering desert heat to listen to the cascading notes of the canyon wren.

through alders and evergreens to keep close to the rugged shoreline, we began to appreciate our luck. The waves here, just beyond our landing, were battling with a precipitous shore.

We came to a sheer cliff and followed it. Abruptly, as dusk drew on and the cold blast warned us back, we broke through matted, wind-timber evergreens to flush a great goose from the brink of a precipice. At two or three paces from us, the Canada honker took one leap and was a-wing on the up-rushing wind above crashing

breakers below. On mossy rock, not more than a wing's width from the forty-foot cliff edge, perched her down-lined nest. But our eyes followed the wide-winged bird as she hung uncertainly on the gale, dropped reluctantly on rocking pinions into the high-flung spume, and then with powerful, driving strokes swept away low over the waves of the fast darkening inlet.

We pulled a scattered gray blanket of down over a full clutch of eggs. And presently, uncertain of our way in the crowding inland conifers, broken outcrops and on-coming dark, we turned back to the boat. Inadvertently we had discovered the most memorable homesite I have encountered in the wild.

Many sights in canyons and rocklands give a leap to the heart and a vault to the soul. A prairie falcon plunging down with whistlings wings above white granite boulders of the Mojave. The cleaving pinions of a golden eagle cruising past snow-crowned peaks of the San Juans. The silver stretch of a vulture wheeling distantly in the desert blue. The dripping moss hut of a dipper shimmering in rainbow spray of a cliff-hung waterfall.

What gain from glimpses from the heights, or passing incidents in rocky citadels?

From these fragments of living as we find it in the wild, from these experiences at the roots of life, we attain a truer understanding, piece together a more vital pattern for the pathway we ourselves must follow. 🌿

WAXWINGS IN THE APPLE

*I saw them first invade the apple tree,
Descending on it in an avalanche
As if the tree were theirs. Then I could see
Their pale sleek bodies strung along each branch
Like amber beads, and not a single feather
Ruffled or out of place. There was no sound
Except their noisy lispings all together,
A few green apples dropping to the ground.*

*And then a cloud of wings, and they were gone,
Leaving no trace upon the summer air.
Was it a trick of light, the slant of sun,
Or had the cedar waxwings gathered there?
Only the fruit, swaying like tiny bells,
The quivering leaves, gave answer. Nothing else.*

Mae Winkler Goodman

American tradition has a niche for

The Catfish

By PERCY L. DePUY

WHEN I was ten years old, my notion of the ideal sport was catching "bullheads" from a mid-Western creek. My candidate for the perfect meal was a platter of those same bullheads, cleaned, dipped in beaten egg and fried in real country butter. A half-century has not changed that ideal. I still like to catch bullheads, channel catfish and other members of the catfish clan. When I sit down in a restaurant and see "fried catfish" on the menu, I order it even though it is fried in cooking oil and the price is usually more than I can afford.

Catfish are a part of the American tradition. They enter into our recreation, our commerce, our literature, and the diets of many of us. Furthermore, this family of fishes is an important ecological wheel in Nature's machine.

Trout and bass are justly famous food and game fishes, but it is likely that more Americans derive pleasure from catching and eating catfish, because they are more adaptable to varying conditions of habitat, and therefore more universally available than are trout and bass. Fried catfish is a traditional delicacy in many parts of this country, and has been the foundation for thousands of festive fish fries down through the years.

With the exception of the channel catfish and the blue cat, the members of this family would scarcely qualify in a piscatorial beauty contest; but, like many humans, they make up in usefulness and dependability what they lack in comeliness. The catfish family is a large and honorable one in the world of fishes.

It has been estimated that there are more than a thousand known species of catfish throughout the world. There are some thirty species native to the United States, and at least one species of catfish is found in almost every reasonably permanent body of water in the temperate and torrid zones of the earth. These fishes are absent in the colder parts of the world. Most species confine themselves to fresh water, but some catfish live only in the sea, while still others can adjust to either fresh or salt water.

Catfish species vary greatly in size and habits, but they also have certain characteristics in common that set them off from other families of fishes and help to identify them. They do not have scales, but are covered with a smooth, tough skin. An exception to this rule is the armored catfish of South America, with bone-like plates.

George Sursa, fishing permittee at the White River Refuge, St. Charles, Arkansas, holds a 46-pound blue catfish that he took from the White River.

Photographs by courtesy of U. S. Fish and Wildlife Service unless otherwise credited.



Most species of catfish have a pair of feelers, or barbels, on their upper lips, and from one to three pairs on their lower lips. These feelers are thought to be equipped with sense organs similar to our own organs of taste or smell. They probably help the creatures locate their food, since catfish often live in water that is too muddy for good vision.

Another distinguishing catfish characteristic is the presence of a small fatty or adipose fin, located on the back in front of the caudal or tail fin. A few other kinds of fishes also possess such adipose fins.

Catfishes have a stiff, sharp spine near the front edge of the dorsal, or back fin, and one near the front edge of each pectoral fin. These are defensive organs and can inflict painful, although seldom serious, wounds if one is not careful or is inexperienced in handling the fish.



KANSAS FORESTRY, FISH & GAME COMMISSION

The spawn, or egg mass, of the channel catfish is all deposited at one time, and may contain from fifteen to forty thousand eggs. The spawn at left was photographed at a Kansas fish hatchery.

While the catfishes have similarities that set them off as a family, they also have differences among themselves that divide the family into genera and species. The adults of the different species vary in length from one inch to ten feet, or even more. The sheath fish, a European species, is a giant catfish that sometimes attains a length of ten feet and a weight of 500 pounds.

Some kinds of catfish can live out of water for several hours at a time. There are blind species that inhabit the waters of caves. One species is at home only near waterfalls, and certain diminutive kinds live in the gills of larger fishes. One parasitic species gnaws holes in the sides of big fishes and subsists on their blood. There are catfishes in Africa that are capable of producing an electric shock like that of the electric eel.

Two species that live in the sea might be called submarine "baby sitters." After the eggs are fertilized, the males carry them around in their mouths until they hatch, and then carry the young fry around in the same way until the youngsters are ready to "strike out" on their own.

The American species vary mainly in size and in the water conditions to which they are adapted. Some species require water that is running and fairly clear, others can exist in almost any water hole that does not go dry every year and is an adequate source of food.

Our big catfishes demand deep water and plenty of room. One of these, the blue cat, sometimes grows to weigh 150 pounds, and is an important commercial fish. It inhabits the larger rivers of the lower Mississippi system, and is frequently called the Mississippi catfish. It belongs to the same genus as the channel cat and, like the latter, possesses a trim, streamlined body and a neatly forked tail. Small blue cats are sometimes mistaken for channel cats.

Next in size among American catfishes comes the flat-head catfish, so called because of its broad, flat head. It also is known as the mud cat and yellow cat, but should not be confused with the yellow bullhead. The flathead inhabits the rivers of the Mississippi system and the southeastern United States, and may attain a weight of fifty pounds. It is important commercially, and is a favorite with many people who fish for recreation or to supply their own tables with food. It is often large enough so that the cook can carve steaks and roasts from it.

The midgets among American catfishes are the mad toms, or tadpole catfish, that seldom reach a length of

three inches. The stone cats are only a little larger.

Both of these fishes are frequently mistaken for young bullheads. They both are partial to small running streams, and both make up for their lack of size by having a mildly poisonous secretion on their dorsal and pectoral spines. Being

"stuck" by one of these fishes is about like being stung by a bee. They are sometimes used as bait for larger species of fish.

The aristocrat of the family is the channel catfish, sometimes called the speckled cat because of its sleek, blue hide that is usually, although not always, sprinkled with small, black spots. So handsome and so highly rated as a food and game fish is the channel catfish that it is sometimes nicknamed the "barbed trout," the barbs being the dorsal and pectoral spines. Channels are not large fish, a five-pounder being a nice specimen, although some of them reach two or three times that weight.

A friend of mine who has fished throughout the United States and has caught wall-eyed pike, salmon, trout, bass and other game fishes, says that he gets a bigger thrill from landing a six-pound channel catfish from running water than in catching any other kind of fish. Channels will even break water in their frantic attempts to free themselves of the hook. They will take many kinds of bait, sometimes even striking on a plug.

Such popularity has caused channel catfish to become the subject of considerable scientific research, especially in regard to their propagation in lakes and ponds. At first it was thought that these fishes could live only in running water; hence the name "channel." Then it was discovered that they can live in still water if it is reason-

ably pure. Finally, the researchers learned that these fish also will reproduce in still water if satisfactory nesting sites are available.

Each female channel catfish normally produces from 15,000 to 40,000 eggs a year. The eggs are all deposited at one time, and become glued together in one mass. The female instinctively tries to find some cavity like a submerged hollow log or a muskrat hole in which to deposit her eggs. After the male has fertilized the eggs, he hovers above and guards them during incubation.

Channel cats are not particular about the cavities in which they deposit their eggs as long as they are of approximately the right size and are properly located. Empty nail kegs staked to the bottom of the pond, cream cans with the lids removed, and even old-fashioned auto trunks have been used by these fish as nesting cavities. Such receptacles can be provided by the fish culturist, who can, to a certain extent, regulate the amount of reproduction to fit the carrying capacity of the pond by controlling the number of nesting receptacles provided.

Seth Way, superintendent of the Kansas State Fish Hatchery at Pratt, Kansas, was the first person to develop a practical method for hatching channel catfish eggs artificially. Troughs are used, much as they are in hatching salmon and trout eggs, and it is estimated that Mr. Way has produced three million channel fry for distribution in the waters of Kansas. His system also is

being used by hatcheries in other States. Even Minnesota, with its walleyes and muskellunge, is working with channel catfish because some Minnesota lakes are not suited to walleyes and muskies, and because many folks enjoy catching channel catfish.

The group of small catfishes known as bullheads, or horned pout, has an important part to play in Nature's ecological plan. It is a group with a great ability to survive under hard conditions; these fishes can "take it." They are found in large rivers and lakes, but are most important in situations where other kinds of fishes do not always thrive; that is, in small ponds and the water-holes of little creeks. Bullheads act as scavengers in places that might otherwise have none.

Furthermore, these fishes provide food and sport for people who cannot afford to travel to the mountains or northern lakes every time they get the urge to fish. Bullheads are one of Nature's gifts to small boys, and one that is appreciated by adults, too. Bait is often a gob of wriggling earthworms that are obtainable in most places with but little effort. Fishing gear may consist of a willow pole, cotton line, a bottle cork for a bobber, a shingle nail for a sinker, and a dime store hook.

Biologists recognize three species of bullheads in the United States; the black, yellow and brown. A one-pounder is a fairly good-sized fish, but in some places, they may attain two pounds.

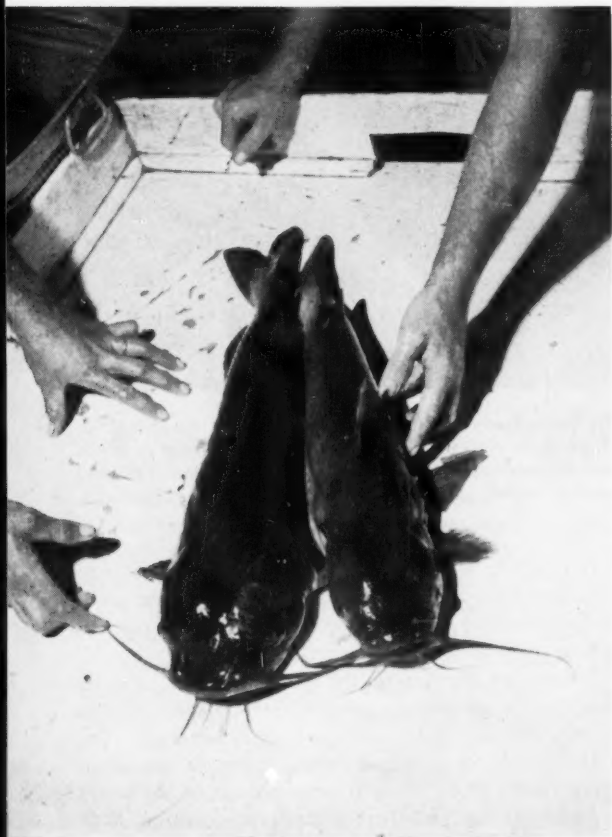
During wet seasons, these fishes—especially those of the black species—leave the larger and more permanent water holes in the bigger creeks and swim upstream. They then push on into smaller and smaller tributaries, until they may be wiggling up a stream that is only a foot or two wide

and six inches deep. If such fish are lucky they may arrive at a pond or pool where the water is two or three feet deep, and remain there to spawn. In this connection, the Kansas State Fish Hatchery does not provide bullheads for stocking purposes, because it feels that these fishes will sooner or later find their way into every body of water that is suitable for them.

I once came upon a small pool in a prairie slough. Close examination revealed a cloud of tiny black creatures, less than one-half inch in length, drifting about in the clear water. Here were hundreds of bullhead fry, and their parents had evidently travelled at least a mile up a little wet-weather stream from a larger and more permanent waterhole.

Some of those fry remained alive in the waterhole for several years, but did not grow fast because the pool did not furnish sufficient food. A summer of low rainfall occurred, and the pool began to shrink. As the water became low, warm and stagnant, a few small sunfish that had worked their way into the hole gave up the struggle and died, but the hardy bullheads remained

This pair of channel catfish—the male at left and female at right—is about to be placed in a brood pen at the U. S. Fish and Wildlife Fish Cultural Station at Tishomingo, Oklahoma.



alive. The water became so thick with concentrated silt that it had the consistency of gravy, and was almost devoid of free oxygen. The bullheads wiggled about in this tepid, smelly soup, half the time under a blazing sun, for several days. They thrust their heads partly out of the mud and gulped down air in order to get oxygen. Only a few kinds of fish can take oxygen directly from the atmosphere in this way.

Thousands of similar waterholes have completely dried up from time to time and millions of bullheads have perished, but those in my pool were more fortunate. The drought was broken just in time by a series of thundershowers that filled the hole with new water and new hope. The fish squirmed out of the mud and were free-swimming once again!

The following June, two small boys caught eighteen bullheads out of that hole in one afternoon. None of the fishes weighed more than a quarter of a pound, but after they had been cooked, the boys ate them with great

relish and pride of achievement. No trout ever brought more pleasure to any anglers.

Had this hole gone completely dry and all the bullheads died, others probably would have come up the little stream and repopulated the pool during the next cycle of wet years. These fish are pioneers in advanced outposts where uncertain conditions make life hazardous. They frequently suffer calamity but keep coming back to try again and again. Pioneers everywhere must be rugged and persistent.

The catfish family has captured the hearts and stomachs of millions of Americans. Here is part of a poem that came from the deep South many years ago. It refers to the yellow or flathead catfish, but could apply to any of a dozen other members of the family.

"Don't talk to me o' bacon fat,
Or taters, coon or 'possum;
Fo' when I'se hooked a yaller cat,
I'se got a meal to boss 'em."

CRICKET-TENANT

*Humility dwells here alone
Beneath a mica-jeweled stone.
Eddie W. Wilson*

The Aromatic Pincushion

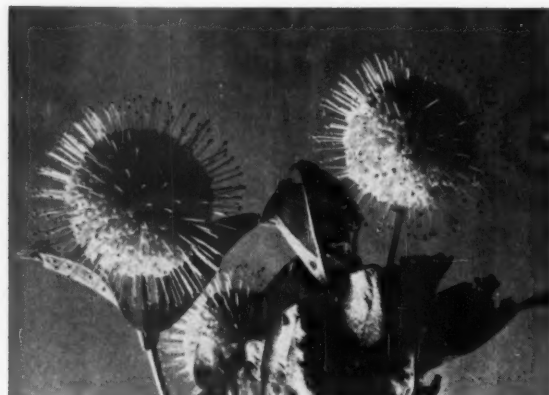
By JOHN R. CLAWSON

Photograph by the Author

To American Indians and white pioneers plodding along streams and marshes and lake sites, the beautiful and aromatic shrub known as buttonbush or bush globeflower was a welcome sight. For, growing with their feet in the water and their globose heads to the sky or drooping in the shadows, buttonbushes provided a rich source of tannin that could be used to treat fevers and malaria.

To hordes of bees and butterflies the plant is equally popular, for its fragrant perfume pervades the air throughout a flowering season that lasts from July to September.

The buttonbush, *Cephalanthus occidentalis*, is abundant and often persistent around swamps, ponds and other watery, low ground from Ontario to Texas, and from Florida to Arizona and California—which means that



The buttonbush, *Cephalanthus occidentalis*, was prized in earlier days as a source of tannin for the treatment of fevers and malaria. Illustrated above are the plant's striking flowers, which usually are about an inch in diameter.

it is at home nearly everywhere in the United States. Yet, despite the beauty and fragrance of the white, compact spheres that make its flowers, it is not often planted in home gardens as an ornamental.

Buttonbush belongs in the madder family, and its ovate leaves are paired oppositely or are sometimes in whorls, and may be from three to six inches long. The stalked heads are about an inch in diameter, but often appear nearly three times as large because of the scores of pins that project from every fragrant pincushion. ❀❀

Desert Amphibians on Display



One type of habitat for desert amphibians is created by permanent or semi-permanent streams having their sources in surrounding mountains, as in the living diorama above. A waterfall flows softly over the man-made rocks at left.



The "living dioramas" at the Arizona-Sonora Desert Museum in Tucson, Arizona, are the first of their kind to be used on a large scale. The above scene, modeled after a Mexican river, offers a view of under-water life.

By

PEGGY PICKERING LARSON

*Photographs by Mervin W. Larson
unless otherwise credited.*

MANY of us are likely to think of a desert as a dry and sandy place, populated primarily by reptiles. It may come as a surprise then, to learn that some amphibians—moist-skinned frogs, toads and salamanders that spend their larval stages in water—also claim the desert as their home. How, we wonder, do these animals manage to survive in our southwestern deserts?

To answer this paradoxical question, the Arizona-Sonora Desert Museum, near Tucson, Arizona, recently has completed a series of outstanding exhibits in a new amphibian room. However, an important part of the story of this amphibian room is not so much about what is exhibited, although the amphibians are an interesting facet of desert life, as the manner in which they are exhibited. These new exhibits are examples of a challenging trend in museum and zoo exhibits, a trend toward the use of living animals and plants within a diorama. The diorama-type exhibit with glass face, painted scenic background, and mounted animals in a simulated typical environmental setting has long been popular with museums; but these "living dioramas" at the Desert Museum are the first of their kind to be used on a large scale, and they reflect ingenuity and inventiveness.

A living animal is more interesting than a dead and mounted specimen. But that living animal is even more interesting and educational when seen in its typical environmental setting and playing its natural role in relation to

the other living plants and animals commonly found there. Because the living dioramas fulfill these conditions so well, they show great promise as a new method of displaying small animals in scientific institutions.

Amphibians survive the rigors of the desert in four typical types of environments, as illustrated by the four living dioramas of the amphibian room. They may live in or around permanent or semi-permanent streams issuing from the mountains into the low desert foothills. Some may live along a usually permanent river that crosses the desert. Others may survive by staying in an oasis created by a rare desert spring. Here are at least three semi-permanent water sources; but the frogs and toads that most arouse our wonder are those that pass accelerated egg and larval stages in summer rain pools—sources of water that are almost literally "here today and gone tomorrow." The adults, after a few nights of riotous frog-living during such rainy periods, spend almost all the rest of the year under ground, away from



A Sonoran green toad, one of the desert amphibian types that buries itself under ground during dry periods, was caught by the camera in the act of calling in the temporary rain pool diorama at the Desert Museum.

the drying desert heat. These remarkable amphibians in their rain pool habitat are displayed in the final diorama.

Each of these four dioramas includes a painted background and a foreground of rocks, soil, running water, and living plants and animals. Therefore, the similarities between conventional museum dioramas and these living dioramas are rather small. Aside from the fact that both types have the glass front, curved scenic background and domed top there are few structural similarities. A regular museum diorama is built to be convincingly genuine when seen by the public, but it is composed largely of plaster rocks, wax leaves and other materials that are perfectly satisfactory when used in a diorama that does not receive any actual wear. But plaster rocks and certain types of imitation plants would be far from satisfactory when used in conjunction with living animals, moist soil and running water.

Rather than the usual canvas or plaster backgrounds, the backs and ceilings of the Desert Museum's living dioramas are made of molded plastic. These rigid backgrounds each can be hydraulically raised a distance of two feet when the exhibits must be serviced.

Water is constantly being circulated through each diorama, requiring the use of pumps and a filtration system. This water also necessitated the building of vents and the use of exhaust fans, hidden from public view, to prevent vapor from forming on the glass of the exhibits. Since the glass fronts of the exhibits are stationary, the water level in the streams and ponds depicted is six

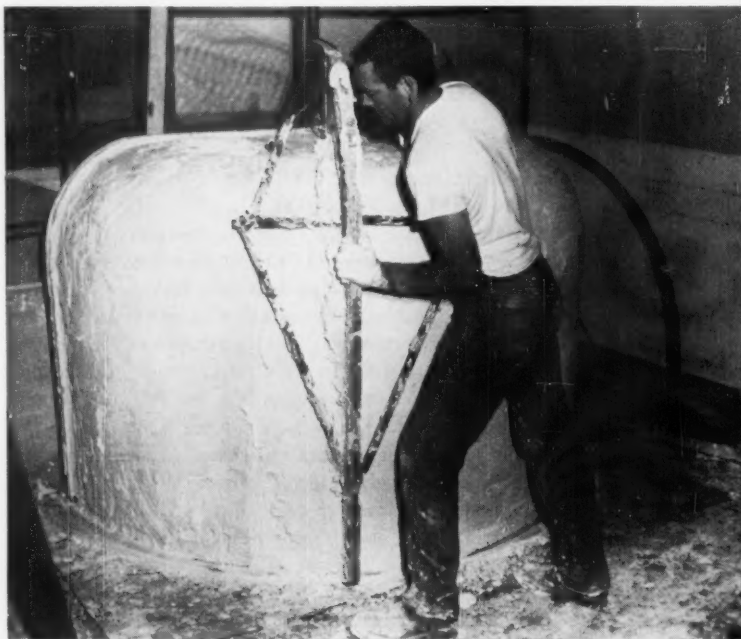
A plaster mold for a diorama's back and domed top is being formed at right. Later, the actual diorama was built by molding plastic over this plaster form, then removing the plaster mold.

inches above the lower level of the glass. This provides a fascinating view of under-water life—insects, fishes, and amphibians—for the visitors. The durable plastic backgrounds make it possible to have the bodies of water adjoin and seemingly blend into the background scene.

In order to have rocks that would neatly fit into place in the dioramas, it was necessary to construct them. Yet, these man-made rocks had to be durable. A method was devised for making them by molding actual crushed rock mixed with plastic. The results were successful, the rocks look genuine, they fit neatly into place against the background, and they are so durable that it is possible to have water running across them constantly—as it does in a waterfall in one exhibit.

For anyone who tends to think that frogs are "simply frogs," the amphibian room offers irrevocable proof that this is not so. In addition to the fact that most of the species of amphibians found in Arizona and the State of Sonora, Mexico, are on display, there also is a colored transparency of each in the labels. These close-up, identifying pictures of each prove that there is a wide and colorful variety in the many types of amphibians. In addition to the picture of each species, there also is a back-lighted range map and a short information text transparency for each. The striking variations among water insects also are made apparent by a display of ten small tanks housing various insects in a way to provide visitors a close view of them not possible in the wild.

PHOTOGRAPH BY WYATT DAVIS



Building durable dioramas and exhibiting living animals can add up to a lot of problems. Mervin W. Larson, Curator of Exhibits, was in charge of planning the amphibian room and devising methods of obtaining the desired effects. Robert Sewell, of the Walt Disney Staff, painted the outstanding scenic backgrounds. Funds for the entire project were generously provided by the Dorothy H. and Lewis S. Rosenstiel Foundation of New York City.

The animals themselves provided many of the problems inherent in building such an exhibit. Keeping a frog happy may sound absurd, but it is necessary if the frog is to be a good exhibit. The foremost problem here is providing food that each type of amphibian will eat. In general, most of the amphibians on display have

learned to eat meal worms. There also is the problem of the big frogs eating all the little frogs. This difficulty has largely been solved by making a special effort to see that all the big frogs have more than enough meal worms, so that they feel too full to eat roommates.

Visitors to the amphibian room find it a most interesting, unusual and informative exhibit, and even the amphibians seem to know a good thing when they see one. Each toad and frog appears to have a favored spot in its exhibit, and will stay there, for the most part. Each has plenty to eat, and seems to know it. For once a day—at the first sound of the opening of the backgrounds at feeding time—the amphibians hop to the opening to claim their shares of the most easily obtained meal a frog or toad ever had! ❀ ❀ ❀

FIREFLIES

*In bright
ballet they pierce
with glint of jewelled dart
the insubstantial curtain of
the night.*

Bertha Wilcox Smith

Case of the Prodigal Orchid

By EZRA ALLEN

ORCHID FLOWERS are among the most elaborate and interesting of blossoms, being the most highly developed among the plants with parallel-veined leaves that are known botanically as monocots—plants having seeds with only one cotyledon or seed-leaf. Of more than usual interest to wild flower enthusiasts is the cluster of *Cypripedium acaule*—the stemless lady's-slipper or moccasin flower—that I found in Sullivan County, New York.

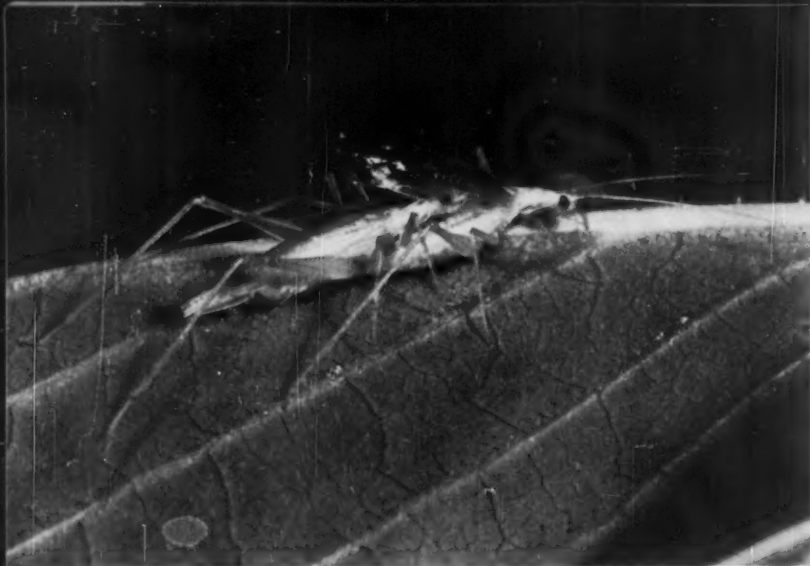
This orchid ordinarily produces only one flower to a root. The specimen illustrated, however, has nine "slippers"—a production that certainly qualifies it as being distinguished among its single-flowered companions. This plant is still quite common in the eastern United States, of course, and its spring blossom is conspicuous because of its large crimson-pink or rose-purple striped floral sack. The distinct groove in this sack is closed almost up to its attachment to the stem,



The lady's-slipper, *Cypripedium acaule*, ordinarily is found as a solitary flower. But in Sullivan County, New York, the author found nine "slippers" growing from the same root.

but the opening is plainly visible in the lowest left-hand blossom in the photograph.

Bees enter this hole in their search for nectar, and while obtaining the nectar some of the sticky pollen of the stamens attaches itself to their heads. Some of the pollen is then deposited on the next "slipper" that is visited, and thus Nature makes sure of fertile seed for a new generation of plants. Orchids are prolific in their production of hundreds of dust-like seeds, to produce the plants that exhibit their showy blooms in spring while the forest floor is still damp from winter snows. ❀



The snowy tree cricket, *Oecanthus niveus*, is the only tree cricket that "chirps," and the male may be heard on cloudy days or even in deep noon shade.

Night Rhythm

By MILLARD C. DAVIS

THE SUMMER evening was filling the honeysuckle bushes that ring our yard. It was in the ivy on our house and in the lawn grass. I reached up and turned on a porch reading lamp over my chair, ready to begin another night of preparation for fall college classes. Then the mood of the season overtook me, and I switched off the light.

It was like the prow of a gray ship, this corner of our porch, reaching out into the soft sea of a warm summer night. I sat at the edge of the flagstone deck and was thrust forward into a realm of gathering sounds and dark, silhouetted masts of trees and shrubbery.

Fifty yards away to my left, a few cone-headed grasshoppers sang with wheedling voices. Overhead the apple tree on our lawn held a katydid. His rasps sounded intermittently. As I listened to these night musicians, I became aware of the rising notes of cadenced murmurings.

The sound seemed to be all about me, gliding out of the honeysuckles, sailing in from the apple tree, beating from the ivy beside me. I swept the yellow beam of a flashlight into the darkness and entered a world of leaves and ghostly voices, the world of the snowy tree crickets. Perhaps it was such a night as this that led Nathaniel Hawthorne to write of these insects, one hundred years ago: "If moonlight could be heard, it would sound like that."

I felt like a crude, inept language student as I probed the night air for the bushes and vines from whence these insects called. A dozen or more of the crickets chirped before me, at my waist and over my head, their voices intermingled in a rhythmical unison. Like so many naturalists before me, I was thrown from side to

side in trying to track down one solitary singer. Finally I spotlighted a pale cricket standing on an ivy leaf. Nearly snow-white in the coned beam, it continued to trill, its wing-covers, or tegmina, upraised and forming a vibrating blur over its back.

I flicked off the light and listened quietly from a short distance. The small voice seemed to melt away, disappearing like a drop of water added to the sea. Up close, the sound is Lilliputian and personal. Sung in unison, the multiplied notes become orchestral and tribal.

Every year since a Salem, Massachusetts, newspaper of the eighteen-eighties carried an account of this mellow rhythm and attributed its cadences to the insect's reactions to evening temperatures, the snowy tree cricket has been building a reputation as "the temperature cricket." As a result of an aroused curiosity, scientists and naturalists have struggled to find formulas that might express this relationship accurately. So far none is completely satisfactory. The insects apparently vary greatly in their responses to the temperatures of the warmest and coolest nights.

Knowing that only the male "sings," I turned to journals and books to learn what effect, if any, his efforts may have on the female. I found that experiments by scientists at Ohio State University indicated that she is attracted by his voice. Furthermore, she hears well enough to distinguish the trillings of her potential mates from those of several other tree cricket species. Thus academically armed, I could imagine the female climbing over twig and leaf in the dark of a midsummer night of music.

Normally the snowy tree cricket, *Oecanthus niveus*,

stands in the dark to sing or stridulate. The only tree cricket that "chirps," the male may be heard on cloudy days or even in deep noon shade. Curiously, some of these insects, captured at night and put in a terrarium indoors, did not seem to be annoyed by our lamps, for they soon filled the living room with a companionable, fluting note. I have noticed that this occurs only rarely among the night-singing, cone-headed grasshoppers and various katydid species that I have brought inside, although I have heard katydids rasp from the fields during bright summer afternoons.

Following the reports of the journals, I watched for and observed indoors the strange "drinking" habit of the female snowy tree cricket. She often climbs upon the male's back and feeds at tiny glands at the bases of his uplifted, stridulating wing-covers. In my glass case, he would sometimes aid her by backing underneath her as she climbed on his abdomen. Always as she fed, his tegmina seemed to float above her, like agitated sheets of cellophane.

Often, during this feeding, the tips of the insects' abdomens came together and mating took place. I occasionally saw a male chase one of the females and thrust his body under hers in mating position. Oddly, he would usually sing even while he ran, continuing the song during the aggressive courtship and apparent mating. Sometimes the hurrying male, while leaping along the twigs and weeds in the terrarium, would choose a wrong pathway and select a new mate. If she "regretted and refused," as often happened, the jar suddenly became filled with a turmoil of leaping, frantic, irate insects.

The snowy tree crickets I captured usually were discovered among the higher leaves of shrubbery and vines. From my readings, this was to be expected. Further reading told me that the generic name of this insect, *Oecanthus*, means "I dwell in flowers." This may be misleading, however, for one author contends that these delicate creatures are but rarely found in blossoms, spending most of their days as leaf treaders and feeders. I never became concerned with this question as a matter of statistics, for the name spoke clearly of the poetic feeling the insect brought to the man who named it.

Toward the end of summer I turned the crickets loose. They entered a world that was becoming spotted with the scattered yellows and golds of maturity. Sugars were beginning to flow from the innumerable leaf blades outside our house, and the disintegrating chlorophyll was revealing hitherto overshadowed amber colors in the leaves. Perhaps this chemical action was to these insects a signal, for the females slice egg-placement scarifications in the twigs during those days.

Summer ended with a tide of rich autumnal coloration. The yellowing of elms, the cider stands along the roadsides, quick rainstorms—all announced the coming equinox, the approaching first day of fall. They also spoke of the frost that soon would scythe away the insects that trilled in our brushes and vines in the waves of a gathering night. Cool evenings forced us indoors as Nature turned toward another season. It would be the month of Julius Caesar, the July of another year, before we might again hear the singing of the snowy tree crickets beating about our porch. ❀ ❀ ❀

The Tree with A Bank Account

By EDMUND J. KIEFER

Photograph by courtesy of Marine Trust Company of Western New York

"You can't stand in the way of progress," most people will tell you; but the people who live in the Springville-Collins Center area of New York State can point with pride to a tall and beautiful elm tree on the Springville Road, and say that this tree is an exception to the rule.

The Springville Road—or more properly, perhaps, the New York State Highway Department—literally went out of its way to dignify rather than eliminate the handsome tree when the new road was constructed. The Department might well have done so; for the residents of the area have always been proud of the great elm, so proud, in fact, that they have done a rather extraordinary thing. Thirty-three years ago, they actually opened a bank account for the tree in the Springville office of the Marine Trust Company to pro-



vide for its lifelong care and grooming. The "woodman" of enlightened progress "spared that tree!"

for August-September, 1959



Tincup Pass, in the Gunnison National Forest of Colorado, is the author's "valley in the sky." Bypassed by modern civilization, this valley is visited by few, and still seems remote and primitive. Mirror Lake is in the foreground.

Valley in the Sky

By ROBERT B. McCOY

Photograph courtesy U. S. Forest Service

A MILLION years ago, perhaps, five great mountains heaved upward from the earth and took with them into the sky a small valley of surpassing beauty. The soft erosion of eternal winds, the ever-changing cycles of centuries wore the rugged summits down to a relative smoothness. The enriching earth and the smiling sun invited the timid forests higher and ever higher up the swelling slopes, until the trees gradually crept over the crest of the barrier and down into the valley of the sky.

Where the valley was born there eventually was born a lake, and it grew bigger and deeper and more lovely with the passing of the years. In the course of natural events, life came to the crystal waters and grew abundant.

Wildlife came to the surrounding forest and prospered. The first law of Nature was the only justice that prevailed throughout this secret land. It was a good law, albeit sometimes a painful justice. The strongest and the most intelligent survived, and the beauty of animals and birds matched the grandeur of Nature in this rugged scene.

All of this came as a legacy to man, and man may yet leave it as a legacy to his descendants. For the valley in the sky is still there, still beautiful, still the silent, remote and primitive place it always has been.

Men have come to those lifting mountains and have named them, one by one. Surveyors have mapped the slopes, the canyons, the ridges and the low places. Roads have been built, and walking trails, as well, until the land in all of Colorado seemingly is accessible with disappointing ease.

But not this valley in the sky; it has been nearly bypassed, so that it is known now to only a fortunate few. It still has about it the mystery of the legendary Shangri-la, and those who have been there treasure their memories of its stillness, its beauty and its pervasive invitation to contentment.

We camped in that valley one night, and it was a night to remember. The sun gradually sank behind the cloud-hung peaks, drawing over the valley in the sky that lingering, purple twilight so customary in the high

mountains. The crisp, fragrant air cooled abruptly, and trout in the transparent lake began to leap hungrily for low-flying insects. The ranks of tall, symmetrical pine trees almost inaudibly commenced their nightly symphony of whispers, and the tired day birds sleepily made way for the secretive night birds.

Fresh wood on the glowing embers of the supper fire; heat changed to smoke as the new logs settled, and a flat ribbon of blue rode upward at an easy drift into the darkening sky. The brilliant point of a star made a transient image on the restless lake, and darkness closed in softly. It was much too beautiful to go to bed, tired though we were.

The marching hours of darkness moved the night quietly into the rising moon that painted the mighty mountains all about with bold strokes of black and white. The lake lightly bore the reflection of the stars, and a broad beam on the ruffled surface moved steadily closer as the moon rode across the sky.

The fire burned lower into embers, and the embers whitened around their cooling edges. A pale, ghostly owl floated out of the black trees and flapped silently across the water-borne moonbeam into the blackness beyond. A porcupine grunted hungrily in the distance.

Dawn came sweetly, accompanied by the multitude of sounds made by birds and small wildlife as they start a new day. Darkness yielded, as it always does, to the power of life and light. Never was air more intoxicating; never did trout bite so hungrily, or so frequently—and never were there such trout! Never in our experience has there been a night and day of such vivid enchantment. If, like us, you like the sensuousness of undefiled Nature, visit this secret valley in the sky; you will find it more a re-creation than a recreation, and it will give you memories rich enough to last a lifetime.

On the Forest Service map of Gunnison National Forest, this beautiful valley is called Tincup Pass; the lake is called Mirror. At Monarch Pass, nearly midway between Gunnison and Salida, on U. S. 50, one turns north on a secondary—or possibly tertiary—road toward a place shown on the map as Taylor Reservoir.

From Monarch Pass, the road winds tightly through dense forest and soaring mountain passes. Blind curves often open suddenly on a compelling view of vast timbered slopes and cloud-touched, snow-crested mountains. Wildlife is everywhere, watchful and wary, but never really frightened.

Deer are abundant, and bears sometimes can be seen watching from the dark aisles of the forest. Grouse and ptarmigan cross the road by dozens, and beautiful Canada jays are quite willing to hitch-hike for a chunk of bread.

On the higher slopes, in plain view from the road, are a bewildering complex of new and old beaver dams. The deeper ponds, dark and forbidding, yield handsome natural rainbows to the careful angler. Porcupines are always under foot, so preoccupied with being porcupines they pay only passing attention to intruding photographers who have no difficulty with these subjects.

High on many a crest and summit is the crumbling entrance to an abandoned gold mine. Through the trees, here and there, are the remains of old, forgotten sluices. In the haze of distance, a good imagination can people the forest and streams again with the ghosts of bearded lonely men in search of gold, ever hopeful of a great strike.

Along the road are occasional log homes, abandoned and crumbling now, but once the abode of a man or a family. What dreams and hopes lie in the sunny dust of the vanished years? What child romped where the woodchuck scuttles out of sight behind a fallen tree? Where are the grandchildren and great-grandchildren of those forgotten men and women? Who now appreciates—or even remembers—the back-breaking, heart-breaking toil that was required to carve a living out of this mighty wilderness?

About half way between Monarch Pass and Taylor Reservoir there lies the weed-grown, boarded-up, broken-down remains of a village that once housed perhaps a hundred families. Tincup, it was called—a gold-camp town that once had civic visions of rivalling neighboring, roistering Cripple Creek. But the gold panned out at Tincup, as it did at Cripple Creek, and one by one the villagers left until the town sat silent and empty of all human life. Yet there is ever a fascination about these ghost towns of an earlier day.

In the lively days, a road of sorts was hacked out of the forest eastward toward a saddle in the mountains. Six miles from the town, this road broke over a rising lip into the secret valley in the sky. It dipped down to pass Mirror Lake, and rose in the far distance to cross the barrier back into the outside world. This was Tincup Pass, and until 1900 the old road offered a rough stage-coach passage through the mountains that surround the valley in the sky.

But when the village of Tincup died, so did the road. For fifty-seven years Nature has been trying to erase this annoying handiwork of man—and has about succeeded. But a keen, squinted eye can see the ancient outlines, and a six-mile walk can take one into the beautiful valley. An ordinary car can not ride this old road; a jeep might, but not easily. To walk it, though, is to know it best.

It is a fine walk, well worth taking even if, at the end, there was to be no valley in the sky. There is life everywhere. A coyote will peer curiously from a stand of tall grass; a herd of alert deer will watch intently from an aspen grove. The Canada jays will go nearly wild with bird-like excitement. Watchful beavers will stand, several side by side, waiting for you to pass before they go back to their busy living. It is truly country rich in its wild inhabitants.

At trail's end lies the valley in the sky, and the moment you start the last half mile downhill toward Mirror Lake, you will have reached what can be—for the time you are there, certainly—your own Shangri-La. Here, for a while, you can find beauty, peace and contentment in a rich and wonderful measure. Why not visit the valley in the sky?





"Gunning" For Butterflies

By PHILIP BRADY

Photograph courtesy of Fred P. Faltersack

Professor Fred P. Faltersack, designer of the butterfly gun, demonstrates his invention.

A HANDFUL of fortunate entomologists throughout the world are now capturing high-flying butterflies by "shooting" them down on the wing—and with absolutely no harm to the insects.

The tricky wing shots have been made possible by a new "butterfly gun" that uses jets of carbon tetrachloride as ammunition. The fluid renders insects unconscious, but they recover from the blast in five to ten minutes and can be freed unharmed. Use of the gun also ends net damage to fragile wings.

The gun is composed of an eleven-pound apparatus that has a knapsack tank similar to the familiar Indian pump for fire-fighting; a short hose, a sixteen-inch barrel mounted on a convenient pistol grip, and a specially developed nozzle. The gun can bring down butterflies or moths flying as high as forty feet above the ground. Thus it makes possible the capture of arboreal types that range among the high branches of trees.

In order to obtain butterflies and moths undamaged, the instrument's designer, Professor Fred P. Faltersack of the College of Engineering, University of Santa Clara, California, developed—after a great deal of experimentation with various fluids, pressures, orifices and barrels—a gun that jets a shotgun pattern of spray with remarkable accuracy.

The new gun was developed in response to a plea for help from a New Guinea butterfly collector, George Rio. Swinging a butterfly net in tropical jungles, Mr. Rio informed Professor Faltersack, was a heartbreaking, un-

rewarding task. What he needed, he was convinced, was some kind of an instrument that would propel a stream of liquid.

Mr. Rio first appealed to an American colleague who sent him a simple water pistol. This worked fairly well, Mr. Rio discovered, but the carbon tetrachloride used as ammunition dissolved the plastic! Next he tried a plunger-type oil can, but the stream it ejected was intermittent and its accuracy poor. A further appeal to his American friend resulted in Mr. Rio's plea being passed to Professor Faltersack, who produced the solution.

Miss Ivy LeMon, lepidopterist for the Massachusetts Audubon Society, says: "The gun gives the collector the choice of banding the butterfly and releasing it, just turning it loose, or dropping it into a killing jar to be used as a specimen. It will be particularly valuable in collecting butterflies in bogs," she added. "In the thick growth and unsteady footing, pursuing butterflies with a net is almost impossible. It will also be valuable for collecting moths at night."

A collector in Africa had only one complaint to register about his gun, Professor Faltersack says. The collector said that he could not find specimens after they were "shot" down—the foliage is too thick! A woman missionary in New Guinea who has one of the first guns reports that the native boys also use the gun to shoot mosquitos in the hospital, in areas the conventional "flit guns" fail to reach.

The "jet" age has overtaken the butterfly! ♀ ♀ ♀

IN THIS JET AGE

*Be glad that yet leaf-tented swings
Can lend to little children wings.*

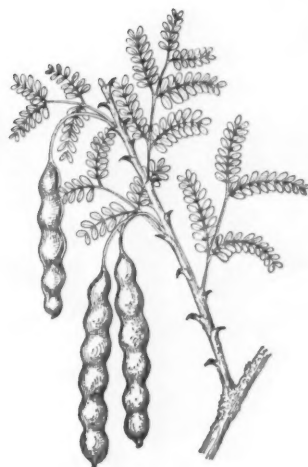
Lucretia Penny

The Legumes— Our Hope for the Future?

By E. LAURENCE PALMER

Illustrations by Elizabeth Burckmyer

*This is the 102nd of
NATURE MAGAZINE'S special educational inserts.*



Cat's-claw



Scotch Broom

THE LEGUMES are not plants for the pessimists. If skeptics deplore the loss of valuable topsoil through erosion, it can be shown that the deep anchor roots of many legumes do much to hold the soil against the erosive forces of wind, water, and traffic. Should the pessimist bemoan the chemical depletion of the soil, we can show that the legumes, linked

with the bacteria with which they may be associated, enrich rather than deplete soils. When the cynics say that the future of our soil resources is bleak, we can point out that, under good circumstances, we may build topsoil at the rate of about one-half-inch a year with the help of legumes. If we worry about our supply of proteins, we know that the legumes can "save the day," if we are willing to make reasonable adjustments. If we are concerned about a lowered water-table, it is

pleasant to know that deep rooted legumes may tap a new supply. Are we lamenting our vanishing wildflowers? We should remember that some of the most beautiful, most fragrant, most persistent and hardiest of wildflowers are legumes. No, the plant kingdom will not let us down in time of need, as we shall see when we consider the potentials for good to be found in the legumes.

It would be possible to devote the whole of this article to the merits of legumes, but perhaps more useful to be specific both as to the plants involved, the services they provide, and the methods by which they may be managed to meet our needs. Whether we realize it or not, legumes play their part in our flesh and blood, in our most prized woodwork, our medicine cabinets, the dyes that please our eyes, the flavors that please our palates, and in many other important elements of our environment.

There are also legumes that are inimical to our interests. Many bear spines that tear our clothing and

Garden Pea



Field Bean



Bluebonnet



Yellowwood





Screwbean



Kentucky Coffee Tree



Lentil



Velvet Bean

our flesh. Many produce poisons that can kill us or our domestic animals. Not a few are weeds that compete successfully with more desirable plants for growing space on our lands. Legumes find a place in our religions, in our economy, in our folklore, literature and nursery rhymes. Coupled with the grasses, they could just about meet our every need. Alone, they may offer our greatest hope for a bright future.

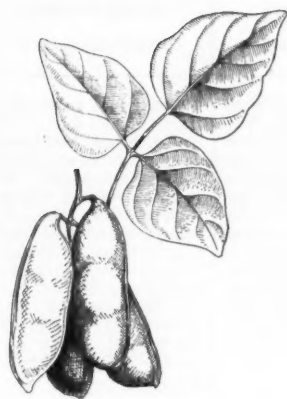
The little nursery rhyme that asks us if we know how "oats, peas, beans and barley grow" may really be more challenging than it appears. In this quartet of plants, we have two grasses and two legumes—a balanced combination that pleases the youngster who uses the phrase, the dietician and the soil manager. We find in *Genesis* mention of Esau and a diet of bread and a pottage of lentils, and the great importance that hungry man saw in them.

In our folklore, we frequently associate legumes with particular places or particular people. Boston and baked beans automatically go together. There is a saying that Leicester beans and bacon make food for a king, and another to the effect that if you shake a Leicestershire man by his collar, you will hear the beans rattle in his belly. (I have never yet tried to test the validity of this statement!) Some sayings imply that an appreciation of beans and other legumes as food is best stimulated by hunger. When I was in the United States Navy, where I learned to love beans, I would have resented any such insinuation. There are, however,

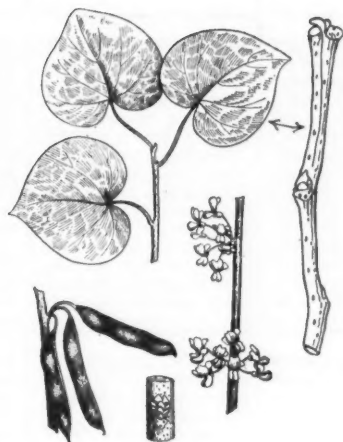
statements that say that hunger changes beans to almonds, and makes raw beans taste of sugar. Hunger, it is said, even makes hard bones sweet beans.

Somehow, beans are commonly associated with intelligence. It is hardly complimentary to say that a person "doesn't know beans" about a certain subject, but I have frequently questioned whether some of our high school and elementary science textbook writers knew their beans, judging by their errors. One saying associated with beans implies that a man who "knows how many beans make five" has a rather critical concept of values.

Possibly no man in modern times recognized and demonstrated more values in a single legume than did the Negro biologist, George Washington Carver, who increased phenomenally our appreciation of the value of the peanut, both in the diet of man and in the enrichment of soil. During World War I, he demonstrated to the government that a sufficient and varied diet, balanced in proteins, carbohydrates, and fats, could be made from the sweet potato and the peanut alone. This eliminated the somewhat inefficient practice of relying on "hog-belly" as an essential in planning a balanced diet. It was also one of the factors that led the South into growing legumes to fight erosion, soil depletion and the dangers of the one-crop system. The use of kudzu, velvet bean and bird's-foot trefoil is discussed in the chart section of this insert, and the importance of soybeans, peanuts and other legumes in general agriculture has been considered in earlier units. Quite possibly it was Carver's studies that gave youngsters of the world that ever-popular food, peanut butter. Here are just a few of the things that Carver derived from the one legume, the peanut—meal, instant and dry coffee, tan remover, bleaches, metal polish, axle grease, linoleum, synthetic rubber, ink, washing powder and plastics. Carver demonstrated that he could get from peanuts alone food comparable to milk, butter and cheese. This improved the health and chances of survival of thousands of people who lived in parts of the world where peanuts



Lima Bean



Redbud



Gorse

could be grown, but where cows could not survive because of insects or temperature. There is not the slightest question that but for his discoveries and his dedication

to serving mankind and his ability to make friends and influence people, the South would not be the prosperous part of our country that it is now. Much of that success was based on his appreciation of the merits of legumes.

A mid-West farmer once boasted that he owned three farms, but that he paid taxes on only one. No one could do anything about it, and he prospered more than his neighbors, who farmed but one of the three farms that were also available to them. The farmer in question grew alfalfa instead of corn alone. The alfalfa roots used the soil that the corn plants would use, and then went deeper to another farm that was untouched by the corn. Water not available to the corn in the dry season was available to the deep-rooted alfalfa. Besides these two farms, the alfalfa used a third, the air from which nitrogen was extracted by the bacteria that the alfalfa harbored, but which the corn did not. This nitrogenous material brought to the soil by the bacteria enriched the soil instead of starving it, so that even the first farm near the surface was richer instead of poorer than the farm that supported corn only.

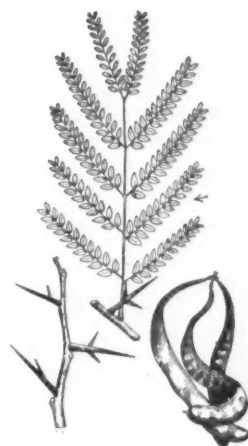
Earlier, we wrote of the valuable combination of grasses and legumes in the diet of animals. Interestingly enough, we know that there is considerable difference in the values resulting from growing Kentucky bluegrass and white clover together. A field that will yield 900 pounds of valuable forage per acre where the bluegrass alone is available, may yield to 3000 pounds per acre if white clover is grown alone. But if the clover and Kentucky bluegrass are planted together on the same soil, the yield may well be about 5000 pounds of forage per acre. Not only is there an increase in the quantity of the forage, but the quality also increases. Thus, if we measure the value of a field in terms of the yield, we may, by management alone, make an acre of land yield more than five times as much forage as might otherwise

be the case, even with methods that long had been considered sound. The importance of this to our future, with increasing populations reducing the number of acres available per person, is reflected in the fact that, by wise agricultural practices between 1950 and 1956, we increased our agricultural production by fourteen percent, while at the same time our population increased by only nine percent. By this system we also can produce surpluses

that may be useful in helping populations not so fortunate, even though these surpluses may complicate our economy. Much of this improvement in our agricultural future rests on a better understanding of how legumes may be used; not only to increase the yields of our soils, but to guarantee a sustained yield and to produce superior agricultural products. So remarkable has the record of the technical agriculturalists been that there is sometimes criticism that they have been *too* successful. But it promises well for the future.

We have changed our views about the importance and management of many legumes. Bird's-foot trefoil, once considered a weed and then a garden flower, now is considered one of the most valuable of our forage clovers and soil restorers. Sweet clover, once considered only as a weed, now is recognized as having some value as forage, excellent value as a soil anchor and restorer, and superior value as a source of nectar for honey-making bees. Even the lowly weed, none-such, has been credited by range

(Continued on page 368)



Honey Locust

COMMON NAME SCIENTIFIC NAME	CAT'S-CLAW <i>Acacia greggii</i>	SCREWBEAN <i>Prosopis pubescens</i>	KENTUCKY COFFEE TREE <i>Gymnocladus dioica</i>	HONEY LOCUST <i>Gleditsia triacanthos</i>
DESCRIPTION	Tree to 30 feet high, with trunk diameter to 1 foot. Many spreading branches, angled lengthwise and with strong, recurved spines at leaf bases. Bark, furrowed, thickened to 1 inch, longitudinally furrowed, separating into thin, narrow scales. Leaves, alternate, compounded of 1-3 pairs of feathery compound parts, to 3 inches long, slightly fuzzy or downy.	A tree, to 30 feet high, with trunk to 1 foot in diameter, round branches often fuzzy but becoming smooth and light red-brown by third year. Spines to 1/2-inch long, trunk bark thick, light brown to reddish. Leaves fuzzy, to 3 inches long, with pairs of feathery clusters of leaflets. Leaflets to 2/3-inch long and to 1/4-inch wide. Branches spreading.	Coarse tree, to 110 feet high, with trunk to 3 feet through, usually dividing 10-15 feet up into 3-4 main trunks. Twigs, coarse, blunt to 1/3-inch through at tip, brown to gray the first year, with large coarse leaf-scars, alternate. Leaves alternate, to 3 feet long and to 2 feet wide, divided into 7-9 parts and subdivided to 6-14 leaflets, with leaflets and divisions opposite.	Thorny tree, to 140 feet high, with trunk to 6 feet through, and bark to 3/4-inch thick which breaks into narrow, irregular, vertical ridges. Branches bear coarse, 3-forked spines that persist even on the trunk. Leaves doubly compound, to 8 inches long, of 18-28 leaflets 1 1/2 inches long, dark green above and lighter beneath. Foliage generally sparse.
RANGE AND RELATIONSHIP	Some 300 known species of <i>Acacia</i> , mostly found in Africa and Australia, but some in United States. This species favors dry, gravelly places such as hillsides and dry canyon walls from valley of Rio Grande, western Texas, through southern New Mexico and Arizona to southern California and into northern Mexico and Lower California east of San Pedro Martir Mts.	Found on gravelly and sandy flats or in loam near waterways. Ranges through valley of Rio Grande in western Texas and through Arizona and New Mexico to southern Utah and Nevada and on west to San Diego, California; largest in Lower Colorado and Gila rivers, in Arizona. Close relative of mesquite and cat's-claw.	Found commonly in rich bottomlands, or sometimes planted as ornamental or as curiosity. Found from southern Ontario to Pennsylvania, west to Oklahoma, Nebraska and South Dakota but not in pure stands and often isolated. But one species in genus and genus is closely related to that of honey locust. Best grown associated with other trees.	Commonest on alluvial soils that are deep. Found in woods or hedgerows or grown as barrier along property lines. Sometimes grown as ornamental. Found from Ontario to Georgia, west to Michigan, Kansas and Texas but grown outside this range frequently and as an escape; naturalized in most temperate parts of the world.
REPRODUCTION	Flowers, in heads to 1 inch through, borne on bright, creamy spikes that are fuzzy, with 2-3 clusters towards ends of branches. Calyx, half length of petals and slightly united at base. Stamens, to 1/2-inch long. Ovary covered with long, pale hairs. Fruit, to 4 inches long and 3/4-inch wide, hanging unopened until late winter or spring. Seeds shiny, dark brown, lustrous.	Flowers borne in leaf axils, in cylindrical spikes, to 3 inches long, yellow. Petals 3-4 times as long as sepals, with calyx obscurely 5-lobed, yellow, appearing in early spring and in successive crops later. Fruits ripen during summer and into fall, as closely twisted pods of to 20 turns, the spiral being to 2 inches long. Seeds to 1/16-inch long.	Flowers in showy, white clusters, clustered along a central axis near ends of twigs. Trees bear pistillate or staminate flowers with pistillate clusters to 1 foot long and staminate much shorter. Fruit a coarse thick but flattened pod to 10 inches long and to 2 inches wide, containing seeds that are to 3/4-inch wide and imbedded in sweet, dark, rich pulp in winter.	Flowers in clusters, pea-like, appearing May-July, borne from axils of leaves of previous year. Pistillate, in clusters that are slender and to 3 1/2 inches long. Staminate, in short fuzzy, to 2 1/2 inch clusters. Fruit a twisted, flattened, dark-brown pod that has thickened margins, is to 18 inches long, and is borne in clusters of 2-3.
ECOLOGY	Wood heavy, very hard, strong, durable, close-grained, brown or red, with thin, yellow sapwood. Tree strongly drought resistant. 1 pound of seeds yields about 200 usable plants, with 60% germination. One of best of bee plants, yielding superior nectar. Cattle browse plant heavily, but it survives. Generally a poor shade producer where shade is valuable.	Wood hard, durable in contact with soil, heavy, close-grained but not strong, light brown, with lighter sapwood to 7 annual rings thick. Plants are freely browsed by cattle and survive reasonable use in this way. The green or ripe fruits are eaten by cattle, and Indians eat the pods raw or grind them to make a flour that is cooked into cakes by baking.	Wood hard, strong, durable, coarse, dark red, rarely attacked by insects, weighing 43 pound per cubic foot. Seeds number 200 to 300 per pound, with high vitality and slow germination. 3-6 seeds per pod. Flowers appear in June; seeds ripen by October but remain on tree through winter. 100 pound of pods may yield 30 pounds of seeds.	Wood 42 pounds per cubic foot, very durable, bright yellow-brown, with darker streaks and pale, thin sapwood of a dozen annual rings. Pollinated by insects. Seeds distributed by pods rolling over snow. May be harvested September to February, weigh about 3000 to the pound from which about 1000 plants will develop.
ECONOMY	Good soil anchor and soil enricher. Wood finds many local uses. Excellent ground cover for jackrabbits, quail and other "game" species. Gum similar to gum arabic oozes from wounds. Spines give name of cat's-claw. Named after Josiah Gregg, a frontier naturalist and author. Is also called tear blanket and devil's-claw. Indians ate the seeds.	Wood is used as fuel and sometimes in fencing and cheap temporary construction. A stand of screwbean may provide excellent shelter and food for bobwhite, road runners and Gambel's quail. Thickets may provide some anchorage to soil, preventing wind and water erosion to some extent. An excellent honey plant, yielding an abundance of nectar dependably each year.	Wood most valuable for fence posts and used in cabinet work and in general construction. Seedlings may be transplanted from nursery at 1 year. Propagation by cutting of twigs is sometimes practiced with success. In 1820, Long's expedition used roasted seeds as a coffee substitute, and pulp has been used medicinally but is not recognized of standard medicinal value.	Wood used as fenceraills, wheel hubs and general construction. Cattle enjoy eating the fruits and deer, hares, squirrels, starlings and quail known to feed on plant and find shelter under it. Sweet pulp of fruit makes a good relish for man. Plant somewhat tolerant of salinity. Root system, deep or superficial. Root nodules are not formed.

REDBUD, JUDAS TREE <i>Cercis canadensis</i>	SCOTCH BROOM <i>Cytisus scoparius</i>	YELLOWWOOD <i>Cladrastis lutea</i>	WISTARIA <i>Wistaria sp.</i>	GORSE, FURZE, WHIN <i>Ulex europaeus</i>
Small tree to 50 feet high, with trunk to 1 foot through, with grotesque branching. Branches and twigs dark. Twigs may zig-zag and are slender. Leaves with long petioles and distinctly heart-shaped blades, with entire margins and conspicuous veins. Blades to 6 inches long and the same width. Leaves appear after the flowers.	Much-branched shrub that reaches a height of to 10 feet, nearly smooth, with long, straight branches that are erect and angled. May kill back to ground in winter but grows again in the spring. Leaves, of 1-3 leaflets, to 1/2 inch long, weakly fuzzy, blunt and the upper leaves without petioles and smaller than those below. Hardiness of tops varies.	Tree to 60 feet high, with trunk diameter to 4 feet, and with trunk often divided close to ground. Branches spreading, and bearing hanging zig-zag branchlets. Leaves are compound, to 1 foot long, of 5-11 leaflets, each of which may be to 4 inches long, with terminal one usually the shortest. Leaves turn bright yellow in autumn and are most attractive.	Plants usually have stout, climbing, woody trunks. The Japanese, <i>W. floribunda</i> , has 7-9 pairs of leaflets; the Chinese, <i>W. sinensis</i> , has less than 7 pairs of leaflets and flowers more than 1 inch across; the silky, <i>W. venusta</i> , has silky leaves; and the American, <i>W. frutescens</i> , has flowers less than 1 inch in diameter. Of these, the Japanese is probably most popular.	Compact, tangled, striped shrub that reaches a height of to 6 feet, is stiff, fuzzy when young but smooth when old, surviving cutting and browsing remarkably. Evergreen. Leaves reduced to scales or to narrow, fuzzy, to 1/2 inch-long spines that make an impenetrable hedge or tangle. Underground system makes good soil anchorage.
Found on rich lands along stream borders or on rocky hillsides, often forming a dense cover along mid-Mississippi areas. Ranges from Ontario to Florida and west to Texas and Nebraska but planted freely outside this range, where it succeeds as an attractive ornamental. 7 species known from North America, Europe and Asia, with 2 close relatives to west of range.	Established as an escape, from Nova Scotia to Virginia and west to Vancouver Island and California but of varying abundance. A native of Europe, being most abundant on sand or loam and even clay. Some 45 species in the world native of Europe, western Asia and northern Africa. This species is widely naturalized as an escape.	Found from North Carolina west to Kentucky, Tennessee and Missouri but planted widely and freely as an ornamental in the northeastern part of the United States and, in Europe, in southern and western parts. It favors the sun and dry, well-drained soils. There is but one species in the genus, and this genus is closely related to another found in Manchuria.	Ordinarily does well on dry, sandy soil but does better on rich loams. Common names suggest parts of world from which some come. The silky species comes from Korea and Japan. The American native ranges from Virginia to Florida and west to Texas with a smaller flowered species, <i>macrostachys</i> , found from Illinois to the south.	Native of western and southern Europe but has been planted and established or escaped in many parts of world. In North America, found along Atlantic Coast from Massachusetts to Virginia and along West Coast, California to Vancouver Island. In New Zealand has proved to be a blessing and a pest, since it may occupy soils that support superior crops.
Flowers borne in dense clusters, pinkish to purple, pea-like, about 1/3-inch long, appearing March through April. Flowers in clusters of 4-8, rarely white. Fruit grown in South by end of May and in North by mid-summer, being shed by early winter. Seeds about 25,000 per pound, with 80% germination, yielding to 2000 usable plants per pound. Seed treated with hot water.	Flowers are bright yellow, to 1 inch long, in long, terminal, leafy clusters. Calyx and supporting stem smooth. Anthers alternately large and small. Fruit a pod to 2 inches long, flattened and with often persistent black to brown coiled style at tip. Flowers appear in May and June and fruits ripe in August and September.	Flowers appear May to June, in clusters of more than a foot long and 6 inches wide, appearing every other year. Corolla is white and about 1 inch long. Stamens, 10 and distinct. Fruit a short-stalked, smooth pod that appears ripe in September, is to 4 inches long and to 1/2 inch wide and bears 6-20 seeds that are usually shed rather soon.	Flowers of <i>floribunda</i> violet to blue, pea-like, in long, showy, drooping clusters, with a hairy calyx whose upper 2 teeth are broad and flat. <i>W. sinensis</i> blooms late in the season and may form great, drooping clusters to more than 1 foot long. There are double varieties but these are not too hardy. Plants may apparently flourish but make no blooms.	Flowers borne singly or in clusters of to 3, but usually crowded towards end of branches, bright yellow, fragrant, to 3/4-inch long, with calyx and corolla almost equal in length. Individual stalks supporting flowers are short. Fruit a small, flattened, feed-seeded, brown, fuzzy, 1/2-inch long pod that matures in August to October. Flowers in May-June.
Wood weak, hard, to 40 pounds per cubic foot, dark red-brown, with light sapwood to 10 rings thick. Plant roots do not bear nodules. Soils vary from slightly acid through sand and loam to those that are calcareous. Seeds are stored and layered in sand and given hot water treatment if planted in spring.	Highly drought resistant and will survive salt. Has been considered in part as parasitic on roots of oak but this is not a necessary relationship. Seeds weigh 65,000 to the pound and are sown in spring after being treated with hot water. Plants may be easily propagated by cuttings merely thrust into suitable ground.	Wood hard, to 39 pounds per cubic foot, strong, yellow, changing to brown on exposure, and with thin, white sapwood. Tree may thrive on rich lime soils or on neutral soil. It is normally propagated by seeds that are collected from September and October, stored in strata in sand in winter and then sown in the spring.	May be transplanted but usually with some difficulty. May be started by stem cuttings, root cuttings or by top grafting root systems that are already established. Plants grown from seeds do not normally "come true" to expectations in all respects. Flowers appear in early summer and fruit of <i>frutescens</i> is mature in September through November.	Blooming plants most popular with bees. In some parts of range it may bloom through the year, yielding nectar and pollen that is popular with honeybees. Some sparsely-spined forms have considerable value as forage and a great appeal as ornamentals but less value as a hedge builder. May sometimes be grazed by sheep and cattle.
A valuable and beautiful ornamental, grown in northeastern States and in Europe. Has an Oriental appearance. Leaves provide little if any forage for cattle, but may be eaten freely by deer. At least 3 kinds of birds, including bobwhite quail known to feed on parts of plant, which may be eaten by marsh rabbits in captivity. Supposed to bluish for Judas betrayal.	An ornamental. Good ground cover but leaves are considered as poisonous to livestock, which avoid it if other forage is available. Recommended as a soil restorer, in part because of high potash content of its ash when the cover is burned over. Burning over may eliminate the plant temporarily. Is eaten by bobwhite quail, California quail and cottontails.	Because of showy flowers the tree is a popular ornamental through wide area. Wood has some value in construction work and is popular for use in making gun stocks and sometimes in cabinet work and inlay. It is used as a fuel and yields a clear, beautiful, yellow dye. Honey from the nectar has a strong amber color and a distinctive flavor. Nectar is abundant.	Among the most popular woody vines grown on porches, on walls of stone buildings and may be sufficiently vigorous to climb walls to 4 stories high and hardy enough to survive severe winter weather almost anywhere in the United States. Pruning back to short spurs each winter may stimulate abundance of bloom, but tame just will not bloom so all.	Is a superior soil anchor since it can survive burial in sand and can exist in salty water. Makes excellent fuel, with almost explosive properties. Its acceptance of a wide variety of soils has advantages. In New Zealand, and other foreign countries, it was the practice along land boundaries to sow gorse seed on top of boundary furrows to establish a barrier.

COMMON NAME SCIENTIFIC NAME	BLUEBONNET <i>Lupinus subcarneus</i>	BIRD'S-FOOT TREFOIL <i>Lotus corniculatus</i>	VELVET BEAN <i>Stizolobium deeringianum</i>	KUDZU <i>Pueraria thunbergiana</i>
DESCRIPTION	Herb, to 10 inches or slightly higher. Silky in some regions but not necessarily everywhere. Branches curve upward. Leaves with long petioles, alternate, with 5 leaflets, each to 1½ inches long and arising from common point at end of petiole. Leaflets shorter than petiole, hairy beneath, smooth above, and with narrow stipules at leaf bases.	Annual and perennial strains known. Stems to more than 2 feet tall, sprawling and ascending, slender, smooth, with many arising from a common root system that may be unusually long and penetrating. Leaves of 5 leaflets, three of which are like a clover at the tip and two of which are nearer the stem. Leaflets are pointed ovals, about ½-inch long and dark green.	Twining vine reaching a length of more than 100 feet and twining freely, somewhat white and velvety. Leaves compounded to 3 leaflets, borne on long petiole, the terminal one being the smallest. Largest leaflet may be to 6 inches long and to 4 inches wide, with entire margins, velvety under surface and rather conspicuous veining. Leaves are alternate.	Perennial woody vine, with each crown bearing 3 or 4 vines from a root system that may penetrate the soil to a depth of 12 feet or more. A single vine may grow to more than 100 feet long in a single year and vines may twist around each other, making a tangle. Leaves of 3 leaflets, borne at tip of long petiole, with entire hairy margins. Roots, large, tuberous, starchy.
RANGE AND RELATIONSHIP	Practically limited to the State of Texas where it may grow in great abundance over considerable territory in dry, open country. This is the official State flower of Texas and the only legume that is a State flower. There are more than a hundred species in the genus in the world, including 70 in North America; these are mostly western.	A close relative of the true clovers. There are about 90 species having a wide distribution and much variation. <i>L. corniculatus</i> is native of Europe and Asia but widely established in America. Some races are much more valuable as forage plants than are others. Leaf margins are entire, thus differing from those of the clovers.	Native of Asia and probably of Malaya, but widely planted in United States and thriving from Florida through Gulf Coast region. May grow as far north as Virginia and Kentucky but season this far north is too short to permit maturity. About a dozen species, of which 3 are recognized as having major economic importance and are in cultivation.	Native of China and Japan but introduced into United States and now widely established in the South and as far north as Philadelphia even though in the north it may winter-kill badly. The related <i>P. tuberosa</i> and <i>P. phaseoloides</i> are cultivated widely, the latter being introduced into the country about 1911.
REPRODUCTION	Flowers in a short, terminal, rather open cluster and somewhat scattered. Conspicuous parts are blue, with a white or yellow spot in the center of the standard. Pea-like. Calyx hairy, with the upper lip much shorter than the lower. Fruit a pod that is hairy, to 1½ inches long, and contains mottled seeds that are nearly ¼-inch in diameter.	Flowers borne in clusters of 3-12, spring from a more or less common point, yellow- or red-tinted, much like sweet pea, about ½-inch long and clusters borne on stalk to 6 inches long. Lobes of calyx about as long as tube. Fruit forms slender pods about 1 inch long, the cluster having some resemblance to foot of a bird, giving common name.	Flowers borne in clusters of 3 to 50, on long, hanging stalks, with each flower purple, to 1½ inch long, with whitish calyx that has a broad, triangular upper lip. Fruit a pod to 3 inches long, with long stiff ridged black velvety covering, containing 3-5 plump but slightly flattened seeds that are streaked, speckled or plain dark.	Flowers pea-shaped, purple, borne late in season in axils of leaves and in inconspicuous spikes. Flowers borne on older parts of the plants and so may not appear where the season is short. Flowers to ¼-inch long and fragrant, producing large, flat, hairy seed pods that bear many seeds.
ECOLOGY	Western lupines are numerous and vary from the tree-like <i>L. arboreus</i> through the shrubby <i>L. densiflorus</i> to the somewhat woody deer cabbage <i>L. diffusus</i> , and include forms that are eaten by grazing animals and which are poisonous if so eaten. Damage to horses, sheep and cattle populations may well be serious. <i>L. argenteus</i> of the West is seriously poisonous.	Long used in Europe as a forage but probably introduced into America by accident and as a weed in ship's ballast. Was long considered to be a weed. Finally, it came to be used in gardens as an ornamental but is now recognized as one of our most important forage plants and soil builders. Its use is gaining in popularity in this respect, particularly with perennial strains.	About 110-130 days from planting to reaching of maturity, but immature vines provide superior fodder and green manure long before seed production has been effected. Is often planted with corn which supplies a support for vines. Usual combination is 2 rows of corn to one row of velvet beans. This reduces corn yield but increases fodder value of crop and builds soil.	Propagation is commonly by cuttings of roots or leaves, or by seeds. 500 crowns may be sufficient for acre if planted one to every square 85 feet. Kudzu covering of ground may reduce soil temperature from 140°F. to 89°F., with consequent reduction in loss of soil moisture and conservation of soil water. Fleshy roots yield good grade of starch and bark yields a good fiber.
ECONOMY	Animals with lupine poison may froth at mouth, become highly nervous, experience difficult breathing, have convulsions and die. One record shows that, of 2500 sheep that grazed lupine, 1150 died. This does not refer to bluebonnet, which is protected by law primarily because of spectacular beauty. Pollen and nectar are collected by honeybees in March and April.	It competes successfully with clovers as nourishing food for cattle and as a soil builder, and has value as a forage plant for bees in making of honey. Blooming season may be from June through September in some closely related species and may make spectacular yields after a burnover. Honey is white and has tendency to candy early unless mixed with other honeys.	Vines are too coarse for cutting as hay but a field of corn and velvet beans provides a superior pasture for grazing cattle after the corn crop has been harvested. Vines also supply superior soil anchorage to prevent erosion and the nitrogen restorage to soil is high. Related <i>S. pruriensis</i> known as "cow-itch" because of stinging hairs on the pods.	May yield to 3½ tons of hay per acre per year. Dried leaves make excellent fodder, fair breakfast food and good chicken feed. Leaves produce rich litter comparable to that of a forest. Root systems provide superior soil anchorage and plant is one of best soil restorers, adding nitrogen, stopping erosion, building humus and holding water. It is also an ornamental.

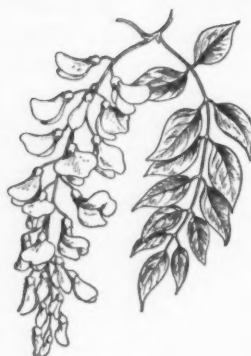
COWPEA <i>Vigna sinensis</i>	LENTIL <i>Lens esculenta</i>	LIMA BEAN <i>Phaseolus limensis</i>	FIELD BEAN <i>Phaseolus vulgaris</i>	GARDEN PEA <i>Pisum sativum</i>
May stand to 1½ feet high or grow as a trailing vine, depending on the variety. Trailing vines may be several feet long. Leaves, alternate, of 3 leaflets on long petiole. Leaflets to 5 inches long, entire or faintly angled, with older leaves short-pointed, stipule bearing. In general, vegetation like that of garden beans.	Herb to 1½ feet high, lightly fuzzy and profusely branched annual. Leaves compound, commonly of 2-7 pairs of leaflets, each about ½-inch long. Leaves usually end in a short tendrill. Leaves may be alternate or opposite. Leaflets slender, oval and entire. Plants may be independently erect or may be partial climbers. Roots bear nodules of importance in soil building.	Bush or dwarf lima bean var. <i>limenans</i> is bushy and not a climber. Typical pole lima bean may have vines to more than 10 feet long which are strong, stout, rather late maturing. Plant is generally velvety, with thick, coarse leaves, each with 3 leaflets, each of which may be to 5 inches long and to 3 inches wide, with rounded bases, pointed tips and thick texture.	Field and garden beans include climbers, bush, bunch and dwarf types. Variation is great but common and trade names have become attached to conspicuous types. Dwarf field beans include red kidney beans and short-vined navy beans. Leaves to 6 inches long, compounded of 3 leaflets, each with rounded bases and pointed tips.	Climbing vine that may reach a length of 6 feet, smooth, shining green, often with a bloom that may be rubbed off. Leaves alternate and compounded of paired leaflets and ending in a freely branched, slender tendrill. Leaves supported at base by stipules that are usually larger than the leaflets. Leaflets are to 2 inches long, oval and entire and in 1-3 pairs. An herb.
Probably of Asiatic origin, having been under cultivation in southeastern Asia more than 2000 years. Grown extensively in warmer parts of the world, coming to the West Indies in 17th century, U. S. in 18th. Closely related to asparagus bean or yard-long bean, <i>V. sesquidalis</i> , and catjang, <i>V. cylindricathe</i> ; latter only slightly cultivated.	Native of southeastern Europe where it is grown for its edible seeds much more than is the custom in the United States. In western Asia and the Mediterranean region, there are about 6 species of the genus with but one cultivated for human food. Grows commonly on dry sandy soils of loams either rich or of poor quality.	Native of tropical America and most extensively cultivated in California in many forms. There are large-seeded and small-seeded, bush and pole lima beans and other types. Lima beans grown mostly in frost-free parts of South and shipped to northern markets. Related sieva bean, <i>P. lunatus</i> , is of the bush type and has smoother, thinner and smaller leaflets.	Native of the Americas. Plants were under cultivation by Incas and used by Indians to the north long before the white man came to America. There are some 200 species recognized in the genus, each with variable types based on size, seed color, speed of maturity, growth habit and the like.	Native of Europe and Asia, mostly in western Asia and the Mediterranean region. Now widely cultivated in almost all temperate countries of the world. Field pea is var. <i>arvense</i> , sometimes having gray marked leaves; edible-podded pea is var. <i>macrocarpon</i> , and early dwarf pea is var. <i>humile</i> , all edible and yielding valuable food to man and beast.
Flowers like greenish-yellow peas borne on long stalks. 10 stamens in groups of 9 and 1, usually opening early morning, closing by noon and falling in afternoon. Fruit, a slender pod to 1 foot long, not flabby or inflated, and bearing many colored seeds of many shapes, which are to ½-inch long and smaller than those of asparagus bean.	Flowers in clusters of 1-3, small, being about ¼-inch long, with the calyx sometimes enclosing the white or blue corolla. Flowers borne on slender stems and rather inconspicuous. Fruits short, broad pods, containing 2 round, flattened, doubly convex, greenish-brown or darker-colored seeds. Genus name, <i>Lens</i> , refers to the shape of the seeds.	Flowers bear slender bracts to the calyx, the bracts being about 1/3 the calyx length and with oval, strongly veined characters. Fruit a large, thick, heavy pod common in groceries, having a length of to 5 inches, a width of 1 inch, a short, blunt, stout beak and containing a number of large, plump, whitish seeds that the pod may open to free.	Flowers pea-like, white, cream, red or violet, with prominent broad calyx bracts that equal the calyx itself. Garden beans are planted in rows to 36 inches apart, at ½ bushel to the acre, usually about 1-2 inches deep, or may be planted in hills to 2 feet apart at 70 pounds to the acre. May yield a harvestable crop in 60 days from the planting under good conditions.	Flowers usually few, usually two to a cluster, borne on ends of long stems that arise from axils of leaves, usually white in garden pea, or bluish or lilac in field peas. Fruit a pod that splits easily to free the delicious spherical seeds, is to 4 inches long. The 2-10 seeds are eaten green either fresh or canned, raw or cooked, and become smooth or wrinkled at maturity.
Seeds about size of navy bean are fed to cattle and poultry and used by man as a coffee substitute. Plants highly sensitive to frost. Seeds are planted in drills at 5 pecks per acre; in rows, at 3 pecks and broadcast, at 8 pecks. When grown for use as hay, plants are often harvested in September, cured 2-3 days as cut, and then stored.	Seeds sown in drills in March, in lines 1½ to 2½ feet apart and require little care after planting. Seeds are frequently preyed on by weevils. Herbage makes excellent fodder for cattle or superior green manure if plowed into the ground. Seeds likely to deteriorate after they are removed from the pods.	Plants cannot be counted upon to mature in the North, since they usually require a frost-free period of to 120 days, and it is not safe to do planting until the soil is well warmed. These conditions make a lima bean crop a considered gamble. Bush type of beans naturally require more space than do the pole climbers.	Dried navy beans yield 1,560 calories to the pound, 22% protein, 60% carbohydrate and 2% fat as contrasted with freshly shelled beans that yield 720 calories, 30% carbohydrate, and 9% protein. Soils that are too wet or too rich in nitrogen do not mature bean fruits well. There are many insect and fungus enemies.	Peas grown for canning are sown in fields, in drills 12-30 inches apart. About 50-100 seeds in one ounce and ½ pint should plant a row to 80 feet long that should yield enough peas for a family for about 10 days. Best to plant at intervals of a week to assure a sustained supply. May be planted early, even before last frost.
One of the best of plants for restoring fertility of soil. Hay is rich in protein. When plants are allowed to mature, the hay and straw decreases in value as cattle food. Submits successfully to being pastured by cattle. Common in rotation such as cotton, corn, cowpeas. Winter grain is planted after the corn and then the cowpeas are planted.	Seeds, the common base of lentil soup, are usually cheaper than beans but fully as nutritious, and in the soup the seeds do not usually retain their entity as is the case with beans. Esau is reported to have sold his birthright to Jacob for a "mess of pottage" made from red lentils, so they must have had considerable value in his eyes, at least.	Seeds rich in protein and starch, and are considered good tissue builders and energy developers by dieticians. They equal lean meat in many qualities and if pork is added to the cooked beans an excellent, balanced ration results. Prolonged cooking is recommended because the proteins are to be found at best in thick-walled cells.	Beans rank high as source of protein and starch in man's diet. Baked beans are a good substitute for lean meat. Green beans are rich in vitamin A, good for vitamin B, and excellent for vitamin C. All beans serve important role in enriching the soil as a part in a crop rotation plan. Usually book-keeping procedure is rather long, but it is worth it.	Canned peas are a staple household food almost the world over but frozen peas are becoming equally important and these support a major agricultural and commercial industry. Field peas that become too old or tough for use as green peas are sold as "split peas" and commonly used in soups. Marrow-fat peas popular because of size and sweetness, but usually sweetest.



Cowpea



Kudzu



Wistaria



Bird's-foot Trefoil

(Continued from page 363)

managers as having some forage value, and much value as a soil builder and soil anchor—particularly on soils too poor to support better types of plants. At least it represents a step in the improvement, not in the deterioration, of soils.

My mother and my grandfather used to speak with enthusiasm about cows standing "knee-deep in clover." Modern pasture management recognizes that cattle will eat more forage during feeding hours if the clover is not much more than six inches tall. The more forage we can put into their stomachs, the more milk we may get from their udders, or the more fat on their bones. The science of pasture management has revolutionized our concept of what it is possible to obtain from our pasture lands. Largely with the help of legumes we can now produce superior yields from lands that a generation ago were considered as marginal, or approaching depletion. Not too many years ago farmers boasted of the farms they had worn out, and a farmer who had exhausted two or three farms was considered to be a real "he-man." Now we look with favor primarily on those who have improved their lands. Almost invariably such successful men use legumes.

In our efforts to get more from our land, we often have gone far afield for help. By developing plants that will stand more cuttings per year, or will reach maturity a few days sooner, we have found it possible to grow plants in parts of our country where formerly they would not have succeeded. We have done this by the use of fertilizers, by the breeding of the plants, and by finding plants that have the characters we seek. All this is part of our modern agriculture. My grandfather never raised alfalfa, but my father began selling the seed in his grocery store. Neither of them ever raised soya beans or bird's-foot trefoil. The soil-saving kudzu, now so widely used on once-eroded lands in the South, was not introduced into America until I graduated from college, and was brought, with soya beans, from China and Japan, where they thrived on poor soils such as were developing here through unwise and abusive soil management practices.

The common names of such legumes as the clovers

may tell us much or little. We have Dutch white clover, which obviously must be associated with Holland, but there also is a giant form now popular that came from Lodi, Italy. It has large, glossy leaves, and as "Ladino clover" is recognized has having great merit. It was introduced into America about the year 1900. Some forms of white clover have colored flowers and bronzy leaves, and are known as shamrocks. But the word shamrock may refer either to a form of white clover, *Trifolium repens*, to a hop clover, *Trifolium dubium*, or to black medic, *Medicago lupulina*, which is closely related to alfalfa. It may even mean a wood sorrel, *Oxalis*, which is not even a legume. Such common names as peas, beans, mesquites, vetches, trefoils and clovers are applied to plants of such different characteristics as to make the names almost meaningless.

The proper handling of the legumes—or of any biologic asset, for that matter—is bound to be a delicate matter. Recognition of true roles is a challenge to any naturalist or scientist. Some years ago New Zealand had a Fulbright Fellow commissioned to develop a strain of bees sufficiently vigorous to withstand the blow received when they were struck by flower parts when seeking nectar. Unless these bees could reach the nectar, their visit was useless. If rough treatment during a visit deterred the bees from quickly visiting a similar flower, pollination would not be effected and the desired seed crop could not be produced.

We obviously have not exhausted the possibilities of finding, in other parts of the world, legumes that are better producers than those we now have. Possibly such foreign plants could be crossed with those that we know render superior service. We may learn how to manage the soils in which these newcomers grow so that we get better results from them. We may learn how to develop insects that would destroy the insect enemies of our legumes, or that might aid our legumes in producing better forage or other products. We may discover bacteria whose presence and proper management would increase our rewards from the legumes, or from the soils with which they are associated. The future of our relationship with the legumes holds great promise of generous reward.



Roadside Protection by Referendum

WHEN legislation was proposed recognizing that safety, scenic beauty and protection of a vast investment required restriction of outdoor advertising along the system of Interstate and Defense Highways, the billboard interests fought hard. Particularly, they pled, this was not a matter for Federal action; legislation should be at the State and local level. Indeed, some of their representatives said that they would not oppose reasonable State regulation.

Sparked by the members of garden clubs and women's clubs, abetted by members of motor clubs, conservation groups, architects, planners, farm groups, nurserymen, landscape architects and many others, the act creating the Interstate System program was amended. The States were offered an incentive to pass legislation that would comply with standards of roadside control promulgated by the Secretary of Commerce. This put the issue squarely up to the States.

No one who has had any experience with the difference between promise and performance on the part of the outdoor advertising business was deluded for one minute by its assertions to the Senate Committee. It was obvious to those of us who so long have sought regulation that the billboard lobby knew that it could control State legislatures more easily. We knew from long experience that the industry's idea of "reasonable regulation" is *no* regulation.

So the legislative battlefield shifted to the States. Maryland had anticipated Federal action and passed a law banning outdoor advertising within 600 feet of the right-of-way of all its expressways. This was amended to 660 feet, to comply with Federal law, by the 1959 Legislature and without any of the crippling changes sought by the outdoor advertising lobby. This was in the nature of a miracle, but shows what can be done when the people let their legislators know what they want, as they did in Maryland.

In 29 other States legislation was introduced; others did not have 1958 sessions; some others are studying how to approach the issue. In some States laws are pending at this writing; in others, such as New York, the billboard lobby was successful in killing legislation, or watering it down so that it failed to mean much or meet Federal standards. Unless it is possible to mobilize all public interest groups in a State, and create at least a modest "war chest," it is difficult to fight a well-heeled industry animated only by a selfish interest. However, even though the battle was lost in many States in 1959, public sentiment was aroused and will, eventually, prevail.

A typical example of the outdoor advertising industry's dishonesty in claiming that it did not object to reasonable regulation is to be found in California. There State Senator John F. McCarthy of Marin County introduced and fought for a bill that could scarcely have been

more reasonable. This measure would have regulated the spacing of outdoor advertising along roads or highways designated as "scenic" by a county board of supervisors. Signs both on and off the premises were permitted for roadside business, and the provisions of the bill did not apply to incorporated areas or land zoned for commerce or industry.

Through its friends in the California Legislature the industry got the bill amended to the point of absurdity. Finally Senator McCarthy rose on the Senate floor to declare that "after all these crippling amendments, it seems to me that the only thing the bill conserves now is billboards. I ask for its resounding defeat."

This course was adopted after consultation with the California Roadside Council, the group leading the forces seeking control. Following the withdrawal of the bill, Senator McCarthy announced that he would seek support to place the issue on the ballot as a referendum. A similar move is planned in Oregon.

"The industry," the Senator declared, "has exerted tremendous pressure on this measure, and it is in an excellent position to do so. (After all, a lot of these lawmakers rely heavily on billboards during their political campaigns.) It is quite another thing to pressure fifteen million persons, however. That's why I think a sound and equitable measure can win on the ballot."

The prospect of a popular referendum on control of outdoor advertising in California—or anywhere else, for that matter—is an extremely interesting one. It has never been tried. We may be sure that the industry will use many of its billboards in attempt to pressure the voting public. It will, certainly, be a campaign of misrepresentation, using all the subterfuges in the past used on legislators and other groups the industry hopes to delude. The billboard boys are not above gangster tactics, as witness anonymous telephone calls to Virginia women leaders warning them to stop supporting legislation to control outdoor advertising.

We do not believe that the majority of the people of California like the violence that outdoor advertising has done to its golden hills and oceanside scenery. We have driven from tip to tip, and criss-cross, in California, and the few places where counties have adopted zoning and roadside protection stand out most vividly in our memory. However, the prospect of a referendum is a real challenge. It will mean a lot of work for the California Roadside Council and its collaborators in offsetting the usual tactics of the industry. But we have a deep conviction that the people of California do not enjoy being victimized by the billboard industry. We believe they resent having the safety of their highways compromised by distracting billboards, or having roadsides along their costly highways parasitized by a selfish interest.





Animals for the Sightless

Charles, at right, feeds a duck held by Mrs. Nadia Kaplan as Chuck, nine years old, and Garry and Ronny, eight-year-olds, await their turns.

A GROUP of excited children were clustered around a smiling young woman, who was tenderly holding a white rabbit. These children did not know that the woman was smiling, however; only the cheerfulness in her heart was conveyed to them as she talked about the bunny. They knew that the pet rabbit was white, because the woman said it was. But they had little conception of "white," other than that it was the opposite of dark. And dark? Well, they were aware of what *that* meant, for they were sightless.

This was the annual summer camp of the Foundation for the Junior Blind at the Foundation's forty-acre Camp Bloomfield in a wooded canyon of the Malibu Mountains, ten miles north of Zuma Beach, California. The woman with the radiant smile was Mrs. Nadia Kaplan, Camp Director and wife of the founder and Executive Director of the Foundation, Norman Kaplan. As for the white rabbit, it was one of the many rabbits that had been donated. A seeing little girl had given it so that those who could not see would thrill to cuddle the white bunny as she had.

Mrs. Kaplan asked the children if they all had heard the story of Peter Rabbit and his long ears. They all had. She asked them how long they thought Peter Rabbit's ears were. Gwendolyn, a nine-year-old, indicated her guess by spreading her thumb and second finger no more than half an inch apart, whereas Charles, a year younger than she, put out both hands as far apart as he was able. The other guesses as to the length of Peter Rabbit's ears ranged in between.

Of course, children who have never seen a rabbit have no way of knowing the length of its ears until they are



A young goat is "seen" by Gary, at the left, and Charles, whose estimation of shape, size and texture is limited to what they can feel with their fingers.

given a chance to hold a real, live bunny and feel the soft ears all the way from the head to tip-top. Only then are they able to appreciate how "long" a rabbit's ears really are in relation to the length of its body.

Mrs. Kaplan permitted Charles, then Gwendolyn and the other children, to handle and feel the white

bunny from head to toes. After each had taken his turn, Gwendolyn sat in one of the camp's iron folding chairs next to the mess hall where the children ate, and stroked the bunny until Mrs. Kaplan directed the group to some of the other animals.

First, Charles fed a duck that Mrs. Kaplan held, as nine-year-old Chuck, eight-year-old Gary and eight-year-old Ronny waited their turns. Then the group visited a baby goat that Charles and Gary examined from bow to stern. Next they "called on" a desert tortoise that some of the boys investigated by stroking the hard shell with their finger tips.

The Foundation for the Junior Blind, a non-profit organization that has a year-around program for blind youngsters from six to twenty-one, originated in 1953 with fifteen members. Today it serves more than 330 sightless persons between these ages, regardless of race or creed, without charge. The Foundation meets operating expenses through contributions. Its purpose is to provide throughout the year education, recreation and sound thinking to children and youths who are blind. The goal is to teach them to grow up as normal,

By WELDON D. WOODSON

Photographs by the Author

This group of boys, all members of the Foundation for the Junior Blind, intently "examine" a desert tortoise with their sensitive fingers.



"Gwendolyn sat in one of the camp's iron folding chairs...and stroked the bunny until Mrs. Kaplan directed the group to some of the other animals."

well-rounded individuals, able to take their places in a seeing community as professional people or trained workers, as mothers and fathers, as good citizens.

In the early part of 1958, the Foundation for the Junior Blind decided to bring to its Camp Bloomfield a variety of domestic animals so that its sightless members could experience direct contact with them. It was felt that this would be a definite contribution to the development of the youngsters.

Before the first group of children was taken to the camp, Norman Kaplan appealed, through a newspaper, for donations of animals to be housed in the camp. The request was reprinted in other newspapers and was mentioned by a number of radio and television newscasters. The only restriction was that there should be no dogs or cats, for many of the children have such pets at home.

"Seeing children learn about the shape and size and texture of animals merely by looking at them in zoos or on farms or just seeing pictures," Mr. Kaplan pointed out in his appeal. "But blind children 'see' with their fingers. If you couldn't see a duck, for instance, with your eyes, you could never imagine what a duck looks like until you got the chance to feel one."

The response to the appeal for animals was remarkable. People drove in to the Foundation's recreation center in Los Angeles from as far away as fifty miles to bring a



turkey or duck. Several small children showed up carefully holding, for example, a tiny turtle, and said, "I want to give you my pet for the blind children."

On the first day following the request the telephone of the Los Angeles headquarters for the Junior Blind rang for twelve hours without a pause. It continued to ring the second day with little letup. A week later, the calls still averaged fifty a day.

A count at that time revealed that 2345 rabbits already had been offered.

In fact, rabbits were pouring in so profusely—"raining them," as someone remarked—that the organization begged, "Please, no more rabbits."

Ducks were runners-up in the animals sent in, totalling 1818. Following ducks were 697 chickens, including a rooster named "Rootie," who comes at call, eats dog food and sleeps in a kennel. Other representations among birds included forty-five pigeons, nineteen parakeets, three parrots, three peacocks and two crows.

The roster of animals brought in also embraced 351 guinea pigs, 216 mice, sixty-six hamsters, eighteen possums, six chinchillas, twenty-seven goats, a white donkey, a lamb, a fawn and a very young calf that the youngsters bottle-fed. Rounding out the animal gifts were fifty-four turtles, two boa constrictors (which were not transported to the camp for obvious reasons), nine horned toads and twenty-five miscellaneous harmless lizards.

Of course, the Foundation was able to accept only a relatively small number of the animals offered. It took the first dozen rabbits, the first twenty ducks—which live on Camp Bloomfield's fishing pond—about eighteen

chickens that furnish an egg-hunt for the children every day, and a few guinea pigs, mice, and other animals. It was necessary to decline the rest with thanks, and the Foundation was able to steer some of the surplus to places like high school science classes.

Director Norman Kaplan particularly wanted ponies. "Gentle ponies," he explained in his appeal, "but not in their dotage."

Five horses and ponies were received, for which the Director was most grateful. It turned out that the children were thrilled actually to ride horseback—even more than to go swimming—and riding was far and away the most popular activity at camp all summer. There was a great amount of proud boasting about improvements in horsemanship, and to those in charge this was inspiring.

"The children were thrilled at the chance to ride," Norman Kaplan said, "and it was wonderful to watch a group start out for a long ride through the woods and up the mountain. A stranger watching them would never guess they were blind. They handled their horses and ponies exactly the same as sighted youngsters would. Learning to ride was a great confidence builder for the children."

Most of the children were amazed at the thickness and depth of the fleece on the sheep. (When your only conception of wool has been gathered from a relatively thin wool sweater, it is hard to picture in your mind the large amount of wool growing on one sheep.)

"Like any normal youngster, blind children love animals," Mr. Kaplan said. "You should see the expression on their faces when they make friends with our burros, sheep, rabbits, geese and other animals for the first time!"

After the summer's acquaintanceship with the animals was over, it was decided that some of the animals would remain at the camp throughout the year, especially



Each summer the members of the Foundation for the Junior Blind enjoy the recreation offered at Camp Bloomfield, near Zuma Beach, California. A variety of domestic animals is available to the children for identification and companionship.

the larger animals like the goats, sheep, burros and horses. A number of the smaller animals have been kept for the Foundation during the winter by high school science classes studying biology, and by individuals. Mr. Kaplan did not see the necessity for another wholesale request for animals for the 1959 camp, but there is definitely a need for more horses and ponies.

This summer it is expected that a total of 225 blind children will be taken to Camp Bloomfield to mingle with their favorite animal pets. There will be four separate sessions; the first session began July first and the final one will end September first. The children are divided into four groups, according to ages, so that each child goes to camp with others of his own age. Thus the number of children at camp each session will vary, but the average number at camp at one time will be

fifty-five, which, sightless or sighted, are enough youngsters to keep any staff busy.

In addition to learning about animals, the children also will swim and take walks; go fishing and boating; play archery and baseball (by sound rather than by sight); go on nature study field trips to learn something about geology, botany, and marine life at the nearby ocean, and attend nightly campfire get-togethers. To sum up, they will be able to do all the things other youngsters do at ordinary "seeing" camps.

Commenting on the results of last summer's sessions, Director Kaplan said: "We can accomplish more with sightless children at summer camp than during the entire remaining year. The children's knowledge of animals and of nature was greatly enhanced by our program of making animals accessible to them, and with increased knowledge of the world outside their little circle of darkness comes increased self-confidence, which is perhaps the most valuable thing we can give them." ❀ ❀ ❀

SMALL BROWN BAT

*You were given more than others
Somewhere in your long ago;
Placed above your mammal brothers,
Over mice and men below.*

*Child of shadows, shunned and praying
To return to sunlit things,
Was the price that you are paying
Worth the wonder of your wings?*

A. Kulik

An inhabitant of Florida scrub land is

The Bird that Likes People

By BLANCHE SYFRET McKNIGHT

NO BIRD in Florida occupies a position in the avifauna of the State comparable to that of the scrub jay, *Apbelocoma coerulescens coerulescens*. Not only is this jay indigenous to the sand-scrub of the Peninsula, but it is one of the most interesting and attractive of Florida birds. Furthermore, of all wild birds it is one of the friendliest and easiest to tame. These jays become constant visitors to feeding stations and bird baths, and often respond to hospitality by alighting on one's head or shoulders and eating from the hand.

Yet this beautiful bird, clad in deep-water blue and soft gray, is threatened with possible extinction. In the opinion of many ornithologists it is losing territory fast. This is due to constant burning of the vegetation that provides cover and food, and to the fact that more and more of the scrub land, since it is easily cleared, is being developed for residential and commercial purposes.

While axes ring and the bulldozers plow away, the jays are forced to take refuge in another and perhaps smaller piece of scrub. This means that fewer young may be hatched, and, in time, the species may become extremely rare, or even disappear, states C. Russell Mason, Executive Director of the Florida Audubon Society. It is known, Mr. Mason says, that the carrying capacity of any given area—food, water, cover and living space—is limited and will support at a given time only a certain number of birds, or other animals. Overcrowding is bad for any wildlife because it limits food and choice of nesting places. Besides it in-

The axe and the bulldozer are making inroads on the habitat of the scrub jay, interesting and attractive inhabitant of the scrub land of Florida.

creases the chances for disease, predation and inbreeding. If development is continued at present rates, the bird authority warns, we can expect recession of range and more limited distribution in scrub jay populations.

"In fact," says Mr. Mason, "there is no doubt in my mind and that of other members of the Florida Audubon

Society that the bird is already greatly reduced in numbers."

"In earlier years," said Dr. R. J. Longstreet, author of several bird books and past president of the Florida Audubon Society, "it was possible to meet with this bird almost from the Florida State line at the St. Mary's River, southward along the entire east coast, but this is no longer the case. During the past twenty years there has been a gradual recession of the range south of Jacksonville, primarily because the scrub land has given way to beach homes." Today, says Dr. Longstreet, the jay is no longer found in Duval County. It is seldom found in or around Daytona or Coronado beaches, where it once was fairly common. "Certainly it has disappeared from areas in which I knew it 35 or 40 years ago," he added, "and I believe the present northern limit of the bird's distribution is somewhat north of Ormond, on the east coast."

To save this friendly bird, a true Floridian, from possible extinction, the Florida Audubon Society recently went on record as favoring the establishment of a permanent sanctuary for the scrub jay. It is now endeavoring to secure, by purchase or lease, or possibly by donation, an area of 1000 to 2000 acres of Florida scrub for this purpose. The executive director hopes to interest members of the Society who have large land holdings, including scrub land, to contribute for a sanctuary





The nest of the scrub jay is built of oak twigs lined with fine rootlets in oak or myrtle bushes or in sand pine trees, two to twelve feet above the ground. Both male and female help in nest building and share in feeding the young.

Photographs by Samuel A. Grimes
unless otherwise credited.

an area that scrub jays are now using and can go on using.

Although there are many areas in Florida known as scrub, a person could spend a lifetime in the State and never see a single scrub jay, for it is so partial to the type of vegetation it inhabits that it is utterly useless to look for it anywhere else. It is found only in the Florida scrub that grows on scattered areas of whitish sand in the lake region, a narrow strip along the east coast, and smaller tracts on the west coast from Manatee County south to Collier County.

Characteristic plants of the scrub are the sand pine and shrubby oaks. The oaks, with the saw palmetto, rosemary and wax-myrtle bushes, form dense and almost impenetrable thickets. There the birds live in loose colonies, perhaps a dozen pairs or so in the same area.

The line of demarcation between where this jay does and does not occur is sometimes almost as definite as a concrete sidewalk, according to ornithologist Alexander Sprunt, Jr. It never is found, for instance, in the open Everglades, or on the Kissimmee Prairie, but where the grasslands meet the central ridges with their scrub oaks and pines the jays appear at once. It does not occur at all in the Panhandle.

The scrub jay is typical of the family to which it belongs—the Corvidae. The male and female differ but little, the male being slightly larger and of a somewhat brighter coloration than the female. However, most authorities agree that the plumage of the adult birds is so nearly alike that it is difficult to distinguish the sexes in the field. The bird is about the size of its cousin, the Florida race of the blue jay, *Cyanocitta cristata*, but unlike its cousin it has no crest. Although lacking the contrast of the blue jay's blacks and whites against the blue, the scrub jay's brilliant plumage is dazzling. His long, indigo blue tail is a striking field mark, while the deep-water blue of his nape, rump and wings shows up well. The back is a light drab, and the

underparts a smoky gray. Its combined colors are lovely.

One of this bird's characteristics is its love of the ground and low elevations. A short-winged species, it takes many short flights, more rarely longer ones. It is frequently seen along roadsides, on the shoulders of the highway, particularly in sandy stretches. On the ground it never walks, but hops with strong, sure jumps, planting the feet firmly.

Much of the jay's food—acorns, wild fruit seeds and all manner of insects—is taken on the ground. Food is about equally divided between animal and vegetable matter. The bird has dainty feeding manners and breaks each piece of food into small bits before swallowing. It pokes surplus food into the sand, usually without digging a hole, and then places leaves or other small objects over the spot where the food is buried.

A survey of the scrub jay made by the Archbold Experiment Station, in cooperation with the American Museum of Natural History, at Lake Placid, Florida, reveals intimate glimpses of the birds' love life. Dean Amadon, eminent ornithologist of the Museum, describes the courtship display. With head held high and tail widely spread and dragging the ground like a blue train, the males circled the females several times in the courtship ritual. Both sexes participate in nest building and share in feeding the young, but the female alone incubates and broods. The maternal instinct in the female, we are told, is so highly developed that she will often allow herself to be touched, and even caressed and moved, while she incubates the eggs. Often the male will scold while his mate is being handled, and neighboring jays may add their voices of protest at the intrusion.

The nests of oak twigs, lined with fine rootlets, are placed in oak or myrtle bushes, or in sand pine trees, two to twelve feet above ground. The eggs, usually two to four in number, are greenish-blue, with olive-

brown spots and splashes. These are laid from the last of March to the last of May, although there are exceptions to this since eggs have been observed as late as June. The incubation period is from fifteen to seventeen days.

Courtship feeding by the male is conspicuous both during the nesting and incubation periods, and to some extent after the young birds hatch. It is generally believed that pairs of these jays remain mated throughout the year.

One interesting fact noted by ornithologist-photographer S. A. Grimes on the recession of this jay's range from its former northern limit about Jacksonville is that there is always a percentage of unhatched eggs. "In fact," he writes, "I have never known all the eggs to hatch in a set of scrub jays." He further states that if that condition is general, it must indicate some form of decadence in the species. Perhaps, he points out, "it is a normal condition at a border extremity of range, due to inbreeding."

Although most jays are notoriously noisy, domineering and meddlesome, there is evidence that the scrub jay is an exception to the rule. True, it is a most active bird that enjoys a great exchange of conversation. Sometimes, if opinions clash, vigorous quarrels may ensue. But the scrub jay does not possess, or rather refrains from using, the harsh, scolding cry of the southern blue jay. At times it gives vent to a series of loud, harsh calls, which resemble the churr-churr notes of the boat-tailed grackle. But bird calls sound different to different hearers, and Dean Amadon states that the commonest notes of the Florida jay are *kre* or *kra*. He also speaks of a peculiar, evidently mechanically produced "hiccuping." The latter is given usually, if not exclusively, by the female and serves as a threat to other jays. Occasionally both sexes sing softly and whisper-like, much like a canary.

The moods of this bird are often expressed in the action of the tail. When on a perch, vocalizing, the tail hangs fairly straight down, but under stress of excitement the tail is jerked and twitched in a highly expressive manner.

A person of my acquaintance, who has had considerable experience with the scrub jay, states that this bird has far better manners than other members of the jay family. Although at times it has been seen to drive off such species as blackbirds and mockingbirds, it appears to live in considerable harmony with its avian neighbors with little bickering and interference. This bird watcher has photographed *coerulescens* with quail, ground doves, meadowlarks and grackles and has yet to see it bully or disturb these birds.

One point that seems to have been overlooked by most

writers is that the scrub jay is what most people consider a beneficial bird. He is such a valiant defender of Florida crops that he is protected by State laws, and is also on the U. S. Department of Agriculture's avian "Honor Roll."

Perhaps his outstanding trait, or at least his most human, is his apparent liking for people. When it comes to begging food, both male and female are alike in their acceptance of humans. A striking example of this is to be found in a little country cemetery at Enterprise, Volusia County, Florida. Here the birds come at call and eat from the hand of not only their benefactor, Elizabeth Brokmeyer, but also from the hands of strangers.

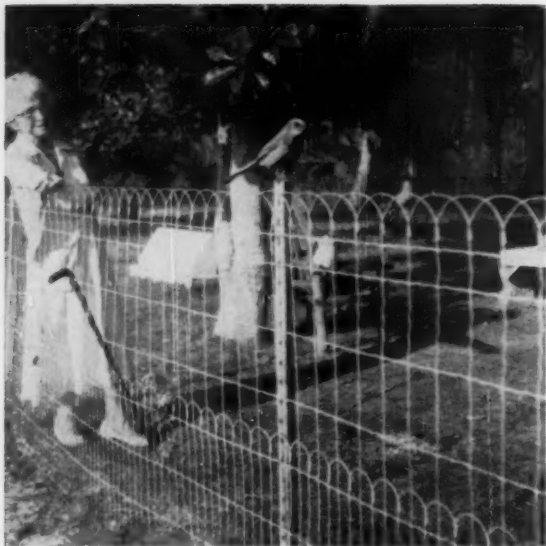
Back in 1943 Mrs. Brokmeyer set up a feeding station for the jays in the tiny cemetery where her son is buried. The birds began to gather whenever she stopped her car and opened the cemetery gate. Soon she realized that they liked raw peanuts. She kept a supply of these on hand as a treat for the jays. It did not take long for them to learn her voice and to eat out of her hand, she said. She began to visit the sanctuary every day. In time she put a bench under the magnolia tree by her son's grave, where she could rest and read, surrounded by her bird friends.

Passing cars began to stop at the sight of the birds lighting on her hair and shoulders, her arms and hands. This unusual memorial to her son has become widely known. Rarely does a day pass without Mrs. Brokmeyer's visiting the place she has tended for fifteen years; seldom is there a day that six or seven persons do not visit the spot, hoping to experience the thrill of

The scrub jay is typical of the family—the Corvidae—to which it belongs. The male and female birds differ but little, the male being slightly larger and of somewhat brighter coloration than the female. In the photograph at right, a male scrub jay brings food to his nesting mate.

for August-September, 1959





PHOTOGRAPH BY THE AUTHOR

At Enterprise, in Volusia County, Florida, Mrs. Elizabeth Brokmeyer set up a feeding station for scrub jays in the cemetery where her son was buried. The friendly scrub jays now gather at this unusual memorial when Mrs. Brokmeyer enters the cemetery, ready to accept raw peanuts from her hand. In the photograph, Mrs. Brokmeyer watches one of these birds of the Florida scrub land.

having the birds eat fearlessly out of their hands.

Mrs. Brokmeyer calls to the birds in a plaintive, sing-song voice. Sometimes she claps her hands or whistles a bright little tune. Usually in a few minutes, the jays appear from the nearby scrub and without hesitation alight on her arms or hands to take the nuts she offers them.

At the time of our visit jays swirled all around us, and finally one came to rest on my outstretched hand. It was a thrilling experience.

On hearing a note of alarm from one of the jays in the thickets, the birds all deserted us and flew into the scrub. Mrs. Brokmeyer says the jays always have a lookout posted on a high bush. The sentinel remains there while the rest are feeding and gives warning of danger. She added: "If you want to see a beautiful sight, watch them at their playtime in the early morning. They frolic together like happy children, hopping about with a great snapping of bills and shaking of bodies, as if life was one great, glorious adventure." I hope some day to see this.

Ten years ago, she told us, there were many more Florida jays in the Enterprise community than there are today. "It's the same old story," she said. "The jay's habitat is being destroyed to make way for so-called progress."

"I was happy to learn," she commented, "that the Florida Audubon Society plans to establish a permanent sanctuary for this beautiful bird that has meant so much to me in the sunset of my life. Every bird and nature lover in the State should support the Society in this worthy project," she declared.

According to Executive Director Mason, the sanctuary will serve not only as a permanent refuge for the scrub jay, but will also serve as an example of an ecologic niche that will demonstrate the plant relationships on such an area.

The ecology of the Florida scrub jay is to many persons the most interesting aspect associated with a study of this bird. There are still unanswered questions, like: Was the scrub jay pushed into this area by the geologically recent ice age and left stranded? Since this species appears to have immediate relatives living in California and Texas, all now referred to as scrub jays, was there in ages past a closer link between them? Have they all become geologically isolated?

Even though these questions remain unanswered, we must admire a species capable of adapting itself to that unique territory of oak, myrtle and sand pine, the Florida scrub, so faithfully and vividly described by Marjorie Kinnan Rawlings.



THE CONCH SHELL

*Whatever I have of beauty will be gone.
The pulsing flesh, the leaping mind will perish,
Leaving behind a gangling skeleton,
Clean but ungainly, for the years to cherish.*

*How cleverer you were, O erstwhile conch:—
What foresight thus to choose your stoutest feature
To be your loveliest; to leave so staunch
A proof that there was beauty in the creature.*

*My bones will understate my case to time,
While you are flattered by a flower of lime.
Georgie Starbuck Galbraith*

Typical of California's Branscomb mud "volcanos" is the one shown at right, which is about to send another of its intermittent gushes of mud over the rim. The bubble coming to the surface through the oozing mud is the result of escaping carbon dioxide gas.



Volcanos in Miniature

By WILLIAM S. PIERSON

Photographs by Edgar Bailey

THE DAY that I had chosen to explore the Branscomb mud volcanos was an unusually hot one. With the temperature hovering around 112 degrees, I began wondering if I had made a mistake, this time, in searching for the unusual. When Edgar Bailey first described these volcanos to me, he had forgotten to mention the heat. But since he was a geologist with the United States Geologic Survey, he probably took such discomforts as a matter of course.

Since these were the only authentic mud volcanos in the Coast Range Mountains of California, I was inclined to believe they could be found easily. This was a false notion; they were practically impossible to find without expert advice.

I remembered Bailey's directions as though he had made a blueprint of them. "Just follow the road west that leads from Laytonville to the Coast Highway," he had said. "After you enter Admiral William H. Standley State Park, turn right on the first dirt road you see."

I did as he had directed. But after I had driven up the dirt road for two miles, it ended, and then came two hours of wandering about in the Mendocino County hills. I had only a "hunch" and a dilapidated trail to follow; and after several false leads, I decided that my hunch was by far the safer of the two.

It proved to be better than I had imagined. After a while, some odd sounds reached my ears. It sounded at

first as though many cows were busily chewing their cud. But as I came closer, I could distinguish the mud pots from the volcanos. The latter made a deep, booming sound, whereas the former were merely a succession of little peeps.

There were five mud pots and five volcanos, separated by the road and a stretch of sloping ground. The mud volcanos averaged about five feet in height, while the mud pots were no more than six inches above the ground. Both existed in an alluvial basin on the crest of a high spur ridge. They were all bubbling—some violently—from the escaping carbon dioxide gas.

The mud volcanos were lined up like soldiers standing at attention. They were, according to geologist Edgar Bailey, following a central fault line. In this respect they are no different from true volcanos, which are often aligned along great fault zones. That does not mean, of course, that there is a necessary connection between volcanos and earthquakes, although faults are often associated with the latter.

The bases of several of these volcanos were composed of brownish-gray material, while the mantles were contrastingly light in color and of a much finer texture. It is speculated that the coarse, darker mud was deposited during the earlier and more violent stages of the crater's existence, the light-gray crest having been deposited in more recent years. This layer-cake appearance is not unlike the composite nature of many true volcanos, where

violent explosions are often succeeded by gentle lava flows.

The source of energy for this cone-building procedure is primarily derived from a hydro-thermal system that is near the surface of the earth in this particular locality. It, however, may be partly due to seepage from the original water of hot volcanic rock deep in the earth.

When either gas or hot water forces itself through the mud on the floor of a crater, great blobs of mud are thrown high into the air. These land around the crater opening and slowly build the cone. Then mud flows, of lesser violence, add still more to the rising cone. Finally, after the cone has risen to perhaps five feet, it is made up of a succession of little layers, built one upon another.

The escaping water is nearly always heavily mineralized, with a constant temperature and flow. These volcanos are rather on the cool side, having a temperature of only sixty-two degrees Fahrenheit.

There is only a slight fluctuation in the activity of the volcanos, which usually occurs when there is a sudden change in atmospheric pressure. Some of the old timers of the vicinity tell us that whenever there is a storm, or when the ocean tide is high, activity increases.

Although the Branscomb volcanos have been visited many times since their discovery in 1865, no one seems to know how old they actually are. Some geologists have speculated that they may be several hundred years old; others believe they date back many thousands of years. Like some of the famous spas of the world, they might have existed when Alexander the Great marched his

The mud flows of the Branscomb "volcanos" remind geologists of the "pahoehoe" lava flows found in the Hawaiian Islands. Their pathways, often blocked by obstructions, have a ropy appearance somewhat similar to that of old-fashioned taffy candy.



legions of conquest across the Middle East and Africa.

When Andrew Atkinson first discovered them, he was probably unaware of what they really were. His name is not recorded on any deed, and it is possible that he considered them worthless and without significance.

A Mr. Petri was actually their first owner; then Mr. J. R. Crandell purchased the site. But after he bought them, he sold all the land except the ten acres upon which the volcanos rest. In obtaining permission to visit them today, the tourist and traveler should contact Merton and Wilda Tosten, of Willits, California, for they are the owners of the property that adjoins the site. They maintain a house there, also, and the family that lives in it might be of considerable help to the visitor.

Although the volcanos are isolated, and appear not to have been used recently for any purpose, some of the pioneers of California considered them a source of health and beautification.

It is said that people once bathed inside the craters by lowering themselves up to their necks in the mud, by suspending themselves from a tree limb, or from a plank that had been placed across the cone. While they were not clean after coming out of the mud, they were supposedly cured of arthritic pains and other maladies.

Pioneer women also found the volcanos to their liking, as they offered the raw material for a feminine mud pack. Sometimes the mud was allowed to dry thoroughly on the face before being removed, after which it could be shed like powder.

This mud was used not only as an aid to health and beauty, but had a third property. Because of its high percentage of borates, it offered possibilities as a ceramic flux. Pottery made from this mud could be molded into a remarkable number of shapes and forms. Geologist Bailey reports that his father made ash trays with this mud, and that several of them are still in use today.

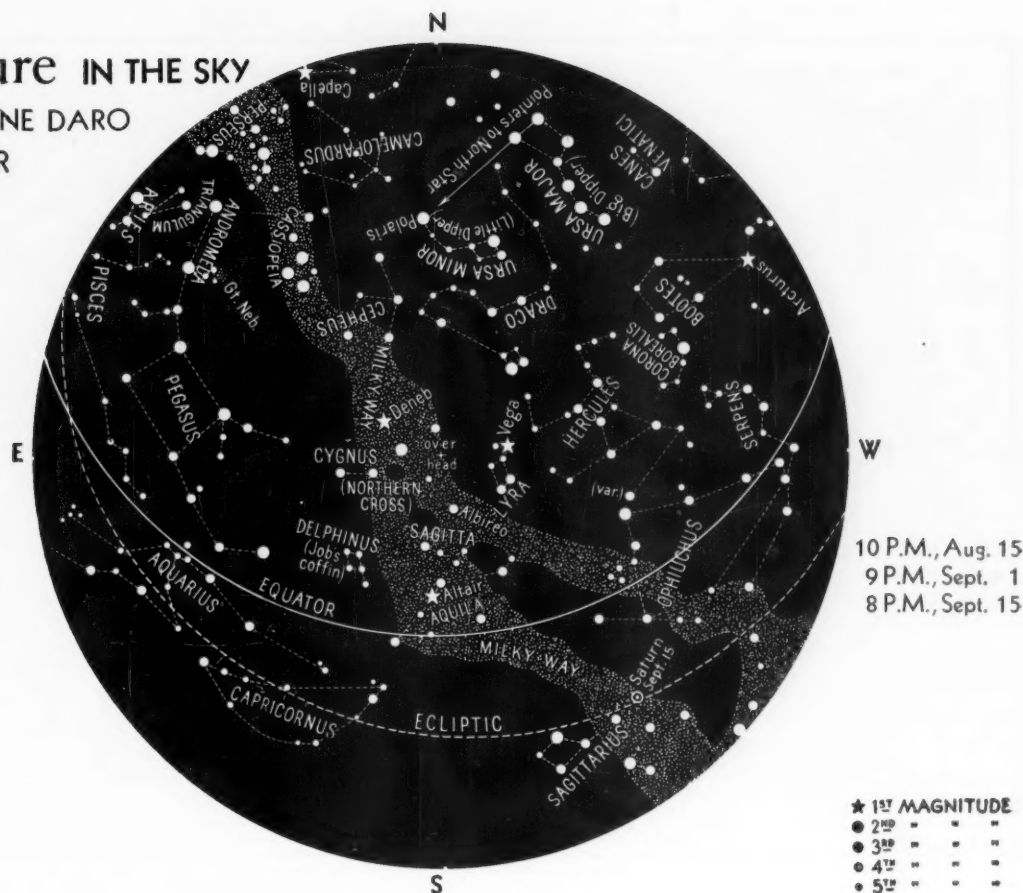
The Branscomb mud volcanos are of great interest to teachers, geologists, and other earth-scientists. Besides the cones themselves, there are a number of mud flows that radiate from the volcanos, quite similar, in miniature, to the pahoehoe lava flows that may be seen at Mauna Loa and Kilauea craters on the Island of Hawaii. The flows have a tough, ropy appearance that reminds you of old-fashioned taffy candy.

Several of the mud flows have proceeded fifty feet or more, whereas others of a more viscous nature have moved only a few yards. The behavior of the mud is thus quite similar to that of lava, which is sometimes retarded in its movement by rapid cooling after eruption.

There are also a few parasitic cones that appear to be growing from the sides of the parent cones. They are as active and as noisy as their parents, although they are slightly smaller. As is the case with true volcanos, they were reared at a time when the principal crater was stopped up with matter that had hardened. (Continued on page 384)

Nature IN THE SKY

By SIMONE DARO
GOSSNER



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. Times given are for Local Standard Time.

Total Solar Eclipse of Oct. 2, 1959

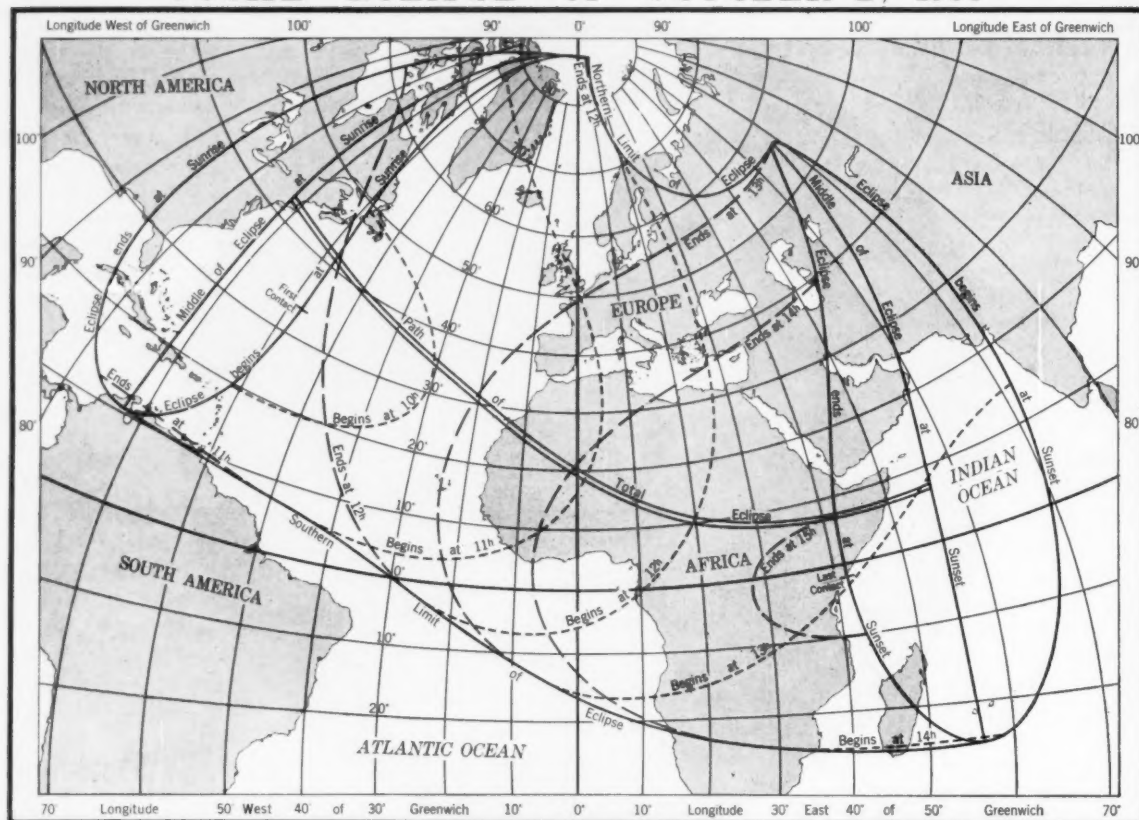
FOR THE first time since June 30, 1954, a total eclipse of the sun will be visible in the United States. The event will take place shortly after sunrise on October 2 of this year, in parts of Massachusetts and New Hampshire.

After leaving the New England coast, the path of totality will continue in a southeasterly direction across the Atlantic Ocean. It will then pass over the Canary Islands, off the northwest coast of Africa. Shortly before local noon, it will reach the African coast in the region known as the Spanish Western Sahara. Continuing eastward, it will cross the Sahara Desert, the Sudan, Ethiopia and the Somali Coast. It will end at sunset in the Indian Ocean. The maximum duration of the total phase (just over 3 minutes) will occur at latitude 19°47' North, longitude 0°22' West—alas, in the Sahara.

As may be seen on the map, the partial phase of the eclipse will be visible in the eastern part of North America, Greenland, the British Isles, most of continental Europe; Asia Minor, and most of Africa will also see it.

It should be noted that, except for the double line marked "Path of Total Eclipse," all other curves on this map refer to the partial phase. Short dashes connect all points on the earth where the eclipse begins at the time indicated. Similarly, long dashes are used to connect points where the eclipse ends at the time indicated. All times are given in Universal Time, that is, in time of the Greenwich meridian. The corresponding Eastern Standard Time is obtained by subtracting five hours from the Greenwich Time. For places where daylight saving

TOTAL ECLIPSE OF OCTOBER 2, 1959



NOTE: The hours of beginning and ending are expressed in Universal Time

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time is kept, only four hours should be subtracted from the Greenwich Time in order to obtain the Eastern Daylight Saving Time.

The best vantage point from which to view the total eclipse should be, without a doubt, on the Canary Islands, barring, of course, inclement weather. Las Palmas, their capital city, is a lovely vacation spot, with a mild climate. There, the eclipse will occur near the meridian, with the sun high in the sky, and the total phase will last more than 2 minutes.

Everywhere else on the track of totality, the sun will be low over the horizon (as in New England and the Somali Coast), or the terrain will be impracticable (as in the Sahara Desert).

If we want to see the eclipse, however, most of us will have to be satisfied with the view we can get in New England. Fortunately, the track of totality goes over the most populated area of Massachusetts. Several million people will be able to see it in their home towns, provided they can get a clear view of the eastern horizon.

The area where the eclipse will be total may be marked off on a road map of Massachusetts and southern New Hampshire, in the following fashion (towns are in Massachusetts, unless otherwise indicated):

First, locate the *central line* by drawing a straight line from Baldwinsville through Ayer, to Salem and on to the ocean. This is the line where the duration of totality is a maximum (about 50 seconds).

For the *northern limit*, draw a straight line from Mt. Monadnock (N. H.) through Milford (N. H.) to the point half-way between Haverhill (N. H.) and Newburyport, and on to the ocean.

For the *southern limit*, draw a straight line from Paxton through Framingham, to Minor and the ocean. Extend this line westward (toward the left) until it intersects the western limit described below.

The *western limit*, or curve of mid-eclipse at sunrise, is obtained by drawing a straight line from Mt. Monadnock (N. H.) to Baldwinsville, and extending it until it intersects the southern limit.

The area where the total eclipse will occur is that enclosed by the northern, western, and southern limits. There is no eastern limit here, of course, because the eclipse continues off to sea. The duration of the phenomenon decreases gradually as the distance of the observer from the central line increases. It is zero at the northern and southern limits.

The best observing points (Continued on page 384)

Nature IN THE SCHOOL

By E. LAURENCE PALMER

Professor Emeritus of Nature and Science Education, Cornell University,
and Director of Nature Education, The American Nature Association

Legumes in School

IT IS DOUBTFUL IF THERE IS ANY SCHOOL, anywhere in the world, that does not have some useful material that might be used to develop appreciation of the genuine value of legumes. This material may involve the plants to be found in the neighborhood; the food to be found in the cafeteria, or in the lunch boxes; the wood used in the school building, or its associated structures; the seeds offered for sale in the stores; the plants offered for sale because of their beauty in the florist shops; the medicines for sale in the drug stores; the plants illustrated in current newspapers and magazines; the convictions, practices and prejudices of local farmers. Investigation of the possibilities in these different realms will not be uniformly rewarding, but they will rarely, if ever, be fruitless. No teacher is likely to fail to uncover some stimulating information if studies of the legumes are undertaken.

Here are a few specific suggestions relative to activities that may be found to be rewarding.

Make lists of the plants to be found in the vicinity of the school to determine how many legumes are to be found there. Use the list in the special insert to help here. As a check list, which of the following are to be found locally—clover, alfalfa, locusts, wistarias, beans, peas, vetches, alfalfa, peanuts, Kentucky coffee, honey locust, mesquite, and so on? Bailey's *Manual of Cultivated Plants* lists 84 genera whose value has been recognized to the extent that they have been brought under cultivation. Look through this book to see how many of these plants are represented locally. The manuals of the wild plants to be found locally will unquestionably add to the list of legumes of local significance.

Check the magazines

Look through any dozen copies of such magazines such as *Life*, *National Geographic*, *Nature Magazine*, *Natural History*, or any available seed catalogs, to see how many plants are shown that are known to be legumes, or show pea-like flowers. Look for articles dealing with the role of legumes in agricultural economy. Look through the available agricultural journals for articles that may enrich understanding of the value of legumes.

From a farm supply house get samples of the seeds normally available in bulk. Bake some garden soil a few times at intervals and on it, in terrariums indoors, sow the seeds of some grasses and some legumes. Is there any difference in the ability of the grasses and the legumes to survive on soils so treated? Dampen some sheets of paper towelling and sprinkle some of the legume seeds on one sheet. By sprinkling keep the towelling damp in an enclosed terrarium and note whether the different legumes germinate with equal rapidity and with equal success.

Keep a record of the foods available regularly at home, in the barn, in the cafeteria or restaurant, or bake shops to get some idea of how thoroughly we are dependent on these plants for our food.

Compare roots

In a corner of the lawn where there is some grass and a few clover plants, dig up a square foot of sod to a depth of six inches, or more. Note whether the roots of the clovers seem to be generally longer or shorter than those of the grasses, and whether clover roots seem to be more substantial. From the text in our insert draw some conclusions appropriate to what you saw in the sod.

Note in the table in the insert of this magazine the plants whose root systems bear nodules that har-

bor bacterial fauna that help in the fixation of nitrogen. Note, also the list of legumes whose root systems do not support such nodules. Collect samples of root systems of legumes that do, or do not, illustrate this phenomenon. Dig up the root system of a small corn plant and of a legume, like alfalfa, of equal size to note any significant differences that may be present. If you live in an area where alfalfa and other field crops are grown note the relative ability of shallow-rooted and deep-rooted plants to continue to prosper in time of excessive drought, or to continue to resist erosion in time of calamitous flood.

If horses or cattle are available offer them bunches of different grasses and legumes to see whether they show any preference. Taste a few leaves of sweet clover and of alfalfa, which closely resembles clover, to see if they are equally palatable to you. Do the cattle and horses have preferences similar to yours?

Explore a blossom

With the point of a pin, explore the throat of an open alfalfa blossom to note how the stamens respond to such interference. Notice how violent this action may sometimes seem to be, and how, by this action, the flower places pollen on a visiting bee or other inquisitive insect. Explore other flowers to see if you can find any that exhibit a similar behavior. Particularly interesting here will be the Japanese barberry, which blooms much earlier in the season than do most of the legumes.

If peanuts are grown locally, notice how the flowers of this plant become buried in the soil and get their pollination from different parts of a single flower, while in most other legumes cross pollination is effected.

Review the woods of local leguminous trees to see if they appear more or less durable than the woods of other trees. Can you find any woods of leguminous trees that are relatively light in weight? If you wish to do a little investigating on your own, cut a few twigs of pen size from the following trees and thrust half their length under-ground in some place where they will not be disturbed for a long while. Note if some decay more rapidly than others. The first five in the list are leguminous and last five are not. Black locust, honey locust, Scotch broom, redbud and yellowwood; willow, poplar, red maple, ash, elm.



THE Nature CAMERA

By EDNA HOFFMAN EVANS

Some Helpful Publications

ALTHOUGH IN RECENT YEARS I HAVE shifted almost entirely to 35mm and $2\frac{1}{4} \times 2\frac{1}{4}$ cameras, my first and oldest photographic love is a beaten-up old 4x5 Graflex that probably can, in a few more years, be classed as a real antique. Smaller cameras are easier to carry around and, in some ways, are more versatile than the larger old style models. Nonetheless, for good, dependable service, I still place the utmost faith in that battered old Graflex.

Because of this long-time loyalty, I was much interested in seeing the eleventh edition of *Graphic Graflex Photography* that came off the press recently. Published by Morgan & Morgan, Inc., of New York, and priced at \$6.95, it is a book worth consideration by anyone interested in photography.

I note, as I compose this, that the review published by *Popular Photography* is not particularly enthusiastic. The reviewer called the book a "watered-down" version of the tenth edition published several years ago, and pointed out that while the previous edition was subtitled "The master book for the larger camera," the current edition is "For prize winning pictures."

I cannot see where either label is conclusive or why the book should be judged on the basis of subtitles. "Masters" of any craft are mighty few and far between, and all too often when material is aimed at the master craftsman it goes sailing completely over the heads of many who enjoy the activity without ever intending to master it. Also, with so many contests open to all ages and degrees of proficiency, why not aim at prize-winning pictures? Is there anything particularly wrong with winning a prize, or even trying to win one? It is good for the ego—even though it gains nothing more than a ribbon or a sticker to tuck away somewhere. Enough, though, of a reaction to a reaction. Let us return to the book itself.

Sixteen contributed

The eleventh edition of *Graphic Graflex Photography* is the work of sixteen contributors, edited by Willard D. Morgan. It contains seventeen chapters plus a picture section of thirty-three photographs, nineteen of them in color. Not all the pictures will appeal to everyone. There is no real "nature" picture in the group, and reproduction of the color scenes is not of the best. However, it has always seemed to me that a person can "learn" in a variety of

"Lighting the Portrait;" "Color Photography;" "Outdoor Photography;" "Traveling With a Camera;" "Photography of Babies, Children, and Pets;" "Wild Bird Portraits;" "Making Photographs for the School Yearbook;" "Fashion and Advertising Photography;" "News and Press Photography" (including a chapter on "Aerial News Photography"); "Police Photography;" "Close-ups, Copying, and the Use of the View Camera;" and "Graphic and Graflex Equipment."

For the nature photographer, the chapters dealing with outdoor photography, travel, color, pets, and wild birds are of the greatest interest. Appeal of the others depends on the additional individual tastes of the photographer.

It always interests me to note how writers on photography invariably manage to say the same things. A good picture does not just happen,



In order to take good bird pictures, the photographer must "go where the birds are." Photographing this nest of young herons necessitated a trip to a coastal rookery, as it was obtainable nowhere else.

ways and such a learning process is well fortified by the pictures that accompany this text. The picture section in most photography books seems more like "bait" to me than real how-to-do-it instruction.

To give a better idea of what the book contains, here are the chapter titles: "Introduction to Prize-Winning Photography;" "Flash Synchronization and Shutters;" "Films, Filters, and Exposures;" "Developing, Printing, and Enlarging;"

we say. Instead, it is the result of skill, planning, imagination, and art, plus an indefinable something that makes it different from the usual run-of-the-mill product. There are rules to be followed, but not slavishly. There are factors to be remembered—lighting, depth, interest, a feeling of movement—and all must be combined artistically but in no mathematically set quantities. Beyond all else, the photographer must be willing to take many, many

pictures, and from them he may winnow a few that are outstanding. That, in essence, is the gist of the opening chapter on prize-winning photography.

Some good points

The Outdoor Photography chapter makes several points that are worth remembering. First, in discussing the use of flash to "balance" daylight illumination, the author tries to dispel the mystery that surrounds "flash" in the minds of some photographers. "The light from the flash is substantially unaffected by shutter speed setting," he states in italicized type. Then he continues: "This means that we can set our shutter speed according to the daylight exposure we need, and the f-stop of the lens according to the flashlamp—and that is all there is to balancing the light."

Another "worth - remembering" suggestion is that of accumulating good cloud negatives to use with other shots in which the clouds fail to cooperate. Always include a small bit of the foreground. This will indicate which way is "up," and prevent the error of printing the clouds upside down in some future picture. Watch the lighting in such dubbed-in-shots so that it agrees—front, side, or backlight—with the lighting in the main portion of the picture.

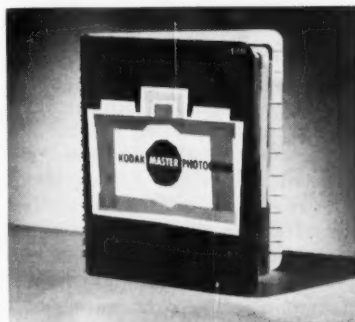
A third pointer is that animals are best photographed in their familiar surroundings, even if it means a sizable clean-up job on the background. This is better than putting the animal in a new setting and trying to persuade it to look natural and comfortable. Also, try taking pictures from the animal's-eye level—or from a bird's-eye view. This will give heightened interest and variation to your pictures.

Good manners essential

One paragraph in the "Traveling with A Camera" chapter makes me want to add a comment. It states: "Don't be shy. A camera bestows a special sort of privilege upon you; having it with you gives you some sense of personal license to take an especially good look at things. Move in close for a look at a fiesta, a parade, a market place, or a statue, and shoot away as you see it." Beware, say I, of that "personal license." Temper it with good manners. You are not the only person in the crowd, or the most important one. Remember that courtesy and

respect for the rights and feelings of others also are important. The author adds, "Be decent to people you wish to photograph, and they will respond with friendliness." I think that more than "decency" is required, particularly from the amateur photographer who is not trying to beat a deadline or score a journalistic "scoop."

The chapter on wild bird portraits recommends the standard things—good equipment, study beforehand, knowledge of the bird subjects, and familiarity with their habits. It also points out that "you must go where the birds are." Too often we self-styled nature photographers sit on the front porch and wish for pictures instead of going in search of them.



This new Kodak Master Photoguide contains a wealth of information for the still photographer, and should be kept handy under all picture-taking circumstances. There is an equivalent Movie Photoguide for movie makers.

Of interest and value because of the wealth of information it contains is the final chapter on Graphic and Graflex Equipment. While the Graflex Company no longer manufactures some of my favorite items of basic and accessory equipment, it is fascinating to see the wide range of material available, from the latest Super Graphic (an all-metal 4x5 model) through a range of sizes down to the twin-lens Graflex 22 that takes 120 roll film, and a variety of Graphic 35's for 35mm pictures.

I think this book is well worth inclusion in any photographer's library, particularly if he does not have any of the recent preceding editions. No one can read or re-read it without picking up a number of useful and usable pointers.

Shooting movie stories

Another book published by Morgan & Morgan, Inc., is *How to*

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Shoot A Movie Story. Authors are Arthur L. Gaskill and David A. Englander. This is a 1959 revised edition of a previous first edition published in 1947.

Aimed at the amateur movie maker and prepared by two veteran professionals, the book is subtitled "The Technique of Pictorial Continuity." It starts with the explanation of a simple sequence and progresses through the build-up, the story, and the editing. It explains how and when to change shots, change angles, change pace, cut-away, cut-in, pan, dolly, and the like. Most of all, it stresses the importance of "telling a story" as well as gaining a pictorial likeness. Even the still photographer, who wishes to give a logical sequence to his shots, will find the book worth reading.

It is available in two formats, paper-backed for \$1.95 and in a hard cover library binding for \$3.50. If the books are not available at a nearby book store or camera shop, the address of the publisher is 101 Park Avenue, New York 17, N. Y.

Two other books newly off the press this year are the latest editions of the *Kodak Master Photoguide* and the *Kodak Movie Photoguide*. Since I have difficulty in remembering vital film, flash, and exposure data—and because I distrust my memory even when I think I remember—I value these little books highly. I think each is well worth the \$1.75 that it costs.

Photographic gold mine

The Photoguides contain a vast amount of general and specific information. Technical data are provided by a series of charts and computers, and by turning the dials and noting the information visible through the windows one can obtain correct exposure information for a variety of films under various lighting conditions. There are guide charts for flash and for flood lighting, suggestions for use with auxiliaries like pola-screens and filters, advice about fast action shots, depth of field, and close-ups. Of a more specific nature, subjects dealt with include under-water pictures, Christmas trees, Niagara Falls floodlighted, and fireworks. There is even a tape measure included with the Master Photoguide to eliminate guess work in focusing close-up pictures with a portra-lens.

These little guides are small and

light enough to carry in a purse or a pocket, and there is room in every gadget bag (no matter how crowded) for one of them. Keep your guide with you at all times while you are taking pictures. If I had followed my own advice I would have fewer dud pictures to show as the result of lapses in memory and poor guesswork.



Volcanos

(Continued from page 378)

The flow was, therefore, forced to seek new channels of escape.

Although the mud volcanos are interesting, the mud pots are equally instructive. They are located in a sedimentary basin of their own, just east of the volcanos. While they have no cones, they do possess appreciable rims that contain a light gray mixture of mud and water.

There are five mud pots, ranging from two to eight feet in width. Since they are shaped in the form of pancakes, they are often compared to shield volcanos of the Mauna Loa type. Their flat, caldera-like sinks have rims that are no more than borders, being less than six inches high. These, however, might have at one time attained the stature of cones. But because of a lack of sloping ground and good drainage, they have been slowly eroding away.

A solitary cone protrudes from among the five mud pots. It continues to exist only because it is located in a little ravine that spilled the mud down into a canyon. It has escaped the forces of erosion so far, but for how long it will continue to no one can tell.

Perhaps someday there will be new and more violent eruptions in this little basin on top of the ridge. Or, like Methuselah, the area may die of old age.



Eclipse

(Continued from page 380)

should be on the Atlantic beaches, where an unobstructed view of the eastern horizon may be had. This is essential because, even on the coast, the total phase will occur only 15 minutes after sunrise, with the sun about two degrees (four solar diameters) above the horizon. The vicinity of Salem will provide the longest duration, but would-be travelers are cautioned to remember that they are not the only ones who discovered this favorable site, and that

sleeping accommodations should be arranged in advance.

In view of past experience, the writer wishes to state, in closing, that she assumes no responsibility for bad weather or cloudy skies.

The New Moon will occur on August 4 and September 2, and the moon will be full on August 18 and September 16.

The sun will reach the autumn equinox on September 23, at 2:09 p.m., Eastern Standard Time.

Mercury will enter the morning sky on August 5 and will remain poorly placed for observation during the first half of that month. It will reach its greatest western elongation on August 23, and will then be in a good position to be seen low over the eastern horizon, just before sunrise. During the whole month of September, it will be too close to the sun for observation, and will enter the evening sky on September 17.

Venus (magnitude -4.1) will appear as a bright evening star, low over the western horizon on August 1. On that date it will set one and one-half hours after the sun. By August 15 it will set one-half hour after the sun and become much less favorable. It will enter the morning sky on September 1, and will remain poorly placed until the middle of that month. It will rise one and one-half hours before the sun on September 15, and nearly three hours before the sun on September 30. By the end of September, it will be conspicuous in the eastern sky at dawn.

Mars will be too close to the sun for observation during August and September.

Jupiter, in Libra (magnitude -1.6), will be found in the southwestern sky at dark. It will set at midnight on August 1, 10 pm on September 1, 8 pm on September 30.

Saturn, in Sagittarius (magnitude +0.6) will be up in the southeast at sunset during the month of August, passing low in the southern sky, and setting at 2 am on August 1, 1 am on August 15. By September 1, it will be on the meridian at sunset. It will set in the southwest at midnight on September 1, 10 pm on September 30.

The Perseid meteor shower will reach its maximum on August 12, when as many as 50 meteors per hour may be seen. The shower may be seen for a week or more on either side of that date. These meteors are more numerous after midnight.



Nature IN ROCK AND MINERAL

By PAUL MASON TILDEN

Nature in the Mail

BEFORE ME AS I WRITE THIS IS A United States commemorative postage stamp of recent

issue. It is the kind of stamp for which this country unfortunately has become well known in the world of philately—the kind that an artist or photographer would, in a charitable moment, merely dismiss as “busy.”

In addition to the usual “U. S. Postage” and the purchase price, there are the words ARCTIC EXPLORATIONS, with appropriate dates; part of a globe; a man riding on a sledge behind an undetermined but apparently sufficient number of sled-dogs; and a submarine, number 571, that seems to be resting inside a transected goldfish bowl. All of this has been engraved on a piece of paper whose dimensions are something less than one by one and a half inches.

The painful contrast

It is fair to say that not all United States commemorative stamps—such as the wildlife conservation series—are as bad as this one; but, in general, they are in painful contrast to the special postal issues of some of the European nations, which for a number of years have been producing stamps not only remarkable for artistic excellence and simplicity of design, but for their educational values as well. The June-July issue of *Nature Magazine* featured an article about two such stamp series—of Czechoslovakia and Rumania—that publicized a number of species of native mushrooms, identifying the plants by their botanical names.

Of more interest here, however, is a set of semi-postal stamps issued by Switzerland during the past year, obtainable from dealers in foreign stamps for about half a dollar. Three of the five stamps in this set illustrate minerals, while a fourth presents a fossil marine animal, all superbly done in natural color against plain backgrounds of a harmonizing color.

The 10 + 10 francs stamp shows a group of golden fluorite crystals of typical cubic habit. There are a



Three minerals and a fossil are illustrated on these handsome Swiss semi-postals that typify a European trend toward using stamps for educational as well as postal purposes.

number of outstanding localities in Switzerland for this interesting mineral of many color varieties, and in this magazine for June-July we described some of the properties and uses of fluorite, more commonly known as fluorspar and less commonly as “blue john” and “Derbyshire spar.”

The 20 + 10 francs postal item presents a fossil ammonite, representative of a group of cephalopods that evolved various coiled and ornamented shells during the immense span of the Mesozoic geological era, and which became extinct at about the end of the Cretaceous period, some hundred and thirty million years ago. The geological story of the ammonite is a rather strange one. Far back in the history of living things—during the Devonian period—the ammonites branched away from their parent stock, the ancestors of the present-day pearly nautilus, and through following millenia produced not less than 5000 species, not one of which survived the end of the Cretaceous period. But the parent stock, the nautilus, with its strange gas-filled chambers, still lives today in our warmer oceans, little changed since it first spawned and then outlived the ammonite!

On the 30 + 10 francs stamp there is a group of wine-red garnet crystals that exhibit the twelve-sided crystal

form so frequently observed in this mineral. The garnets are in a matrix of schist, from which fact collector-sleuths might deduce that these particular crystals probably are of the variety known as andradite.

The last in this group of stamps—the 40 + 10 francs—shows a cluster of quartz crystals so faithfully reproduced that the typical “lines,” or striations, of the mineral’s prism faces are clearly visible. This is a specimen of that water-clear quartz known to the semi-precious gem trade as “rock crystal,” and the Swiss Alps have long been noted as producers of both this and the smoky variety of quartz that sometimes is called “cairngorm.”

Switzerland also has, in other years, produced similarly excellent stamp series, in full natural color, identifying some of the plants and animals of the country. Outstanding among these have been stamps featuring insects like butterflies and moths, and others that brought the light touch of native wild flowers to the more prosaic business of carrying the mails.

GREEN RIVER FIND

In 1956, members of the U. S. Geological Survey discovered a mineral in the rocks of the Green River, Wyoming, sedimentary beds that remained something of a puzzle until recently, when a Russian professor brought to this country a comparison sample of a mineral that had been discovered in the U.S.S.R. in 1955 and had been named “labuntsovite.” The puzzle was solved. Chemically, labuntsovite is a silicate of the elements sodium, potassium, barium, columbium and titanium, and will go into the books—quite properly—as another of those Russian “firsts.”

BOOK REVIEW

Uranium and Other Miracle Metals.
By Fred Reinfeld. Sterling Publishing
(Continued on next page)

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Company, Inc., 419 Fourth Avenue, New York 16. Revised edition. 1959. 128 pages. Illustrated in color and black and white. \$3.95

Fred Reinfeld takes the reader on a tour that begins at some of the world's larger uranium producing mines and ends with the current uses of this metal and some of the other elements that have leaped from text book obscurity into the public view in the past few years—elements like columbium, tantalum and beryllium. There is an unusually readable outline of the chain of workers and events that led through the years to scientist Enrico Fermi's cryptic message to the Manhattan Engineer District in December, 1942: "The Italian navigator has landed; the natives are friendly." Author Reinfeld exposes his readers to a maximum of information and a merciful minimum of mathematical equations in dealing with the chronology of uranium. In fact, the only algebra inflicted on the audience is that battered old hat, $E = mc^2$; a circumstance deemed by your reviewer as worth a pure zirconium medal. ♣ ♣

Bird Exhibit

The birth, development, habits and habitats of young birds, from the egg through the moment that the nestling tries its wings and begins life as an adult, are illustrated in a new permanent exhibit that recently was opened to the public at the American Museum of Natural History, Central Park West at 79th Street in New York City. The nesting season and the problems of this crucial time in the life cycle of birds are described in detail in the ten panels of the new exhibit, which is in an alcove in the Sanford Hall of the Biology of Birds. Modern exhibition techniques using models, drawings, photographs and actual specimens illustrate the diverse and often ingenious ways in which birds care first for their eggs and later for their young. The alcove was given in memory of Ludlow Thomas Lanman by his sister, Mrs. Alexander M. White, Jr., wife of the President of the Museum.

Bulletins

"Water Land and Life" for May, 1959—the second issue of the Western Pennsylvania Conservancy's attractive new magazine—extends an invitation to all conservation- and preservation-minded Pennsylvanians,

particularly those of the western part of the State, to join the Conservancy in its efforts to preserve outstanding scenic, historical, geological, and botanical areas of "Penn's Wood West." The Conservancy already has achieved establishment of McConnell's Mills State Park, and holds 2350 acres of land for another large park-conservation area in Butler County. Interested Pennsylvanians may get in touch with Charles F. Lewis, president of the Conservancy, at 200 Ross Street, Pittsburgh 19, Pennsylvania.

"Careers in Science Teaching," published by the National Science Teachers Association, 1201 Sixteenth Street, N. W., Washington 6, D. C., is a pamphlet for the student with an aptitude and liking for science who would like to explore a possible career in science teaching. The pamphlet asks: What does it take to be a science teacher? It then proceeds to outline qualifications, necessary training, benefits, and responsibilities, with related information. Single copies are free; copies in quantity are 10 cents each.

"Patrol and Troop Forestry Activities," prepared by the American Forest Products Industries, Inc., 1816 N Street, N. W., Washington 6, D. C., is a 22-page illustrated publication designed to assist the Scoutmaster in preparing forestry exhibits, field trips in forestry practices, and conservation trails, and in improving wooded areas for wildlife, as well as in initiating other forestry conservation projects for the Scout patrol and troop. Included are bibliographies of forestry books and movies, and reprints of articles by conservation leaders.

"Conquest of the Land Through 7,000 Years" is Agriculture Information Bulletin 99 of the U. S. Soil Conservation Service, by Dr. W. C. Lowdermilk, who traces the use and abuse of crop-producing lands from the near-Eastern "graveyards" of civilization (caused not by war or pestilence, but by large-scale soil erosion) to the present, and what lessons may be learned from past errors. Thirty pages, illustrated with photographs taken by Dr. Lowdermilk during an 18-month tour of both ancient and modern land use areas, available from the Soil Conservation Service, Department of Agriculture, Washington 25, D. C.

"Atlantic Coast Migrations of American Shad," Fishery Bulletin 142 of the U. S. Fish and Wildlife Service, is a comprehensive discussion of the migration of the American shad, largest members of the herring family in the United States, by fishery research biologists G. B. Talbot and J. E. Sykes of the Bureau of Commercial Fisheries. Includes the life history, tagging programs, analysis of tag returns, homing behavior, and other information; available from the Superintendent of Documents, Washington 25, D. C., and priced at fifteen cents.

"Poisonous Snakes of Kansas," by Robert F. Clarke of the biology department of Kansas State Teachers College of Emporia, is volume 5, number 3 of the Kansas School Naturalist (February, 1959). Before illustrating some of the poisonous snakes of Kansas in full color in this issue, and identifying others, *Kansas School Naturalist* gets in a good word for local snakes that are *not* poisonous, and lists some of the silly myths that have clung to snakes in general. This particular issue of the *Naturalist* is priced at 25 cents (due to the color plates); address of the College is Twelfth Avenue and Commercial Street, Emporia, Kansas.

"The Walleye," publication 227 of the Wisconsin Conservation Department, Madison 1, details the life history, ecology and management of that largest and prized member of the perch family, which inhabits all the major lakes and rivers of Wisconsin. Fourteen pages and cover, illustrated, and with a long list of references, this pamphlet is available from the Department at the address above.

"Michigan Whitetails," a publication of the Game Division of the Michigan Department of Conservation, presents eighty pages of facts about the deer herd of that State and how it is managed. "It was written for people who are interested in deer, like to hunt deer, see deer, study deer, and eat deer," say the authors, David H. Jenkins and Ilo H. Bartlett. Although the reader may not revel in the portions of this work pertaining to hunting, there is a vast amount of information about deer between these covers, written in an entertaining way and illustrated with Oscar Warbach drawings and with photographs. A free copy may be obtained from the Department of Conservation, Lansing, Michigan.

Teacher and Student Aids

The famous "Palmer Educational Inserts" have now reached the 100-mark. A limited number of many of these 8-page Educational pamphlets are still available, as long as they last. Immensely valuable for natural history projects in science, biology and conservation.

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Oliver New Director

Dr. James A. Oliver, Director of the New York Zoological Park, will succeed Dr. Albert E. Parr as Director of the American Museum of Natural History on September 15. In accordance with a new policy of the Museum, Dr. Parr will become Senior Scientist of that institution and thus be able to resume full-time scientific research after years of administrative service. The new Director is a specialist in herpetology but has had extensive experience in research, field work, exhibit development, and both scientific and popular publication. He has long been associated with the Museum, most recently as a research associate. Dr. Parr, who has been in charge of the administration of the Museum for seventeen years, is a noted marine biologist and a graduate of the Royal University of Oslo. During his incumbency the Museum has developed a new philosophy of exhibition and adopted pioneering techniques in the field of interpretation.

Caravan Dates

The dates of 1959's eleventh annual traveling School of Conservation, sponsored by the Conservation Forum of New York State and the Buffalo Museum of Science, will be Saturday, August 22 through Saturday, August 29, it has been announced. This summer's route for the annual adventure in conservation learning will cover much of western, central and northern New York State with emphasis on wildlife areas and the Adirondack Forest Preserve, and also will include a section of Vermont. Instructors for the Caravan will include educators, horticulturalists, farmers, well-known conservationists and specialists of Federal and State agencies. Detailed information concerning the eight-day tour is available from Mabel H. James, Holland, New York.

Anniversary 85

The Canandaigua Botanical Society, of Canandaigua, New York—thought to be the second oldest botanical society in point of continuous existence in the United States today—celebrated its 85th anniversary during the month of May this year. The Society was organized May 12, 1874, and is outdated only by the Torrey Botanical Society of New York City, which was organized eight years earlier, and incorporated in 1871. The celebration took the form of a sess-

ion held at historic "Granger Homestead," in Canandaigua, on May 7, with Dr. Babette Brown Coleman, of the biology department of Rochester University, as speaker. President of the Society is Miss Emma Douglass, of Canandaigua.

Ninetieth Birthday

On April 6 of this year the American Museum of Natural History, in New York City—the objective for more than two and a half million visitors every year—celebrated its ninetieth birthday. To commemorate the occasion, *Natural History Magazine*, official publication of the Museum, presented as a special feature in its April number a thirty-six page pictorial history of the men and events that helped bring this home of Nature adventure and learning to the position it enjoys today. The Museum began its corporate life in a borrowed home on April 6, 1869, with Albert S. Bickmore as both teaching and scientific staff. In 1874, President Ulysses S. Grant laid the cornerstone for the first of the Museum's permanent buildings.

A.O.U. to Meet

Bringing together amateur and professional ornithologists, the 77th Annual Meeting of the American Ornithologists' Union will be held this year in Regina, Saskatchewan, from August 25 to 30. Although the A.O.U. has met in eastern Canada, this is its first meeting west of Toronto. Meetings will be held at the Saskatchewan Museum of Natural History. Field trips are expected to provide fine opportunities for bird watching, including some 10,000 sandhill cranes, thousands of ducks and other prairies species. There will be exhibits of bird art and bird photography, and special meetings at which motion pictures will be shown. Besides the Museum, the hosts are the Regina Natural History Society, the Saskatchewan Natural History Society and Regina College. All bird enthusiasts are cordially invited to attend.

S.C.S. Meeting

Rapid City, South Dakota, will be host to the 14th annual convention of the Soil Conservation Society of America from August 26 to 28. On the opening day of the convention a commemorative soil conservation four-cent stamp will be issued with first-day ceremonies. An important

program of sessions has been arranged and there will be a tour to observe conservation work and other points of interest in the Black Hills, culminating with a beef barbecue at Spearfish. Sessions will be held in the Rapid City High School auditorium.

Fine Film

If enough people could see the new film, "George Washington's River," brought out by the Public Health Service of the U. S. Department of Health, Education and Welfare, there would be such an upsurge of demand for elimination of stream pollution that the problem would be attacked with a real vigor everywhere. This is a 16mm, color and sound film running 28 minutes, and it has been cleared for TV. It shows with terrific punch what has happened and is happening to the Potomac River, and by example, to many other rivers. It shows a filthy stream in which it is forbidden to swim and on which it is questionable to boat. Distribution for public showing is through film service libraries only, and the U. S. Public Health Service, Washington 25, D. C., can supply information as to which libraries have it. Copies may be purchased at \$95.42 from the Motion Picture Service, Office of Information, U. S. Department of Agriculture, Washington 25, D. C.

Bulletins

"Colorado College Studies" number two, for fall, 1958, is a partial annotated bibliography of Colorado ethnology published by The Colorado College, Colorado Springs. While the archeology of Colorado is quite well known, states author Richard G. Beidleman, it is a matter of some surprise that the ethnology of the recent Indians of the State is not at all well known. "Studies" is a 55-page pamphlet that lists Indian publications of a general nature for Colorado, as well as publications in which Indians mentioned are not specifically identified.

"Clean Water in the Missouri" is an 8-page pamphlet of the Federal Security Agency of the U. S. Public Health Service, and is a summary of the important facts released in a 212-page technical report that discusses pollution conditions in the Missouri River Valley, which comprises one-sixth of the area of the United States. Available from the Superintendent of Documents, Washington 25, D. C.

THE Nature MARKET

Classified advertising rate — 25 cents a word each insertion; minimum \$5.00, cash with order. Abbreviations, initials, and numbers count as words. Discount, 3 times, 5%, 6 times, 10%, 10 times, 15%. November issue closes September 20. Mailing date October 20.

Nature Appreciation

During a recent volunteer clean-up job in the Kearsarge Pass region of California's High Sierra, Sierra Club workers gathered for disposal some 26,000 tin cans—three tons—that had been tossed aside by visitors to that beautiful area. Included in the inventory of discarded items were camp-stools, tables, old kyacks, roofing tin, paper, old shoes and worn-out clothing, and an assortment of other junk and trash, according to the Sierra Club *Bulletin* for January, 1959. Other damage to the area included hacked trees, fire-scorched brush, large open dumps and prominent campfire debris scattered about. The Sierra Club is currently engaged in an educational campaign to combat such human impairment of wilderness areas.

Blind Fish

A bizarre blind fish, *Bathytyphlops marionae*, from the depths of the Caribbean, now is being studied by ichthyologists at the Smithsonian Institution in Washington, D. C. They are working with the only two specimens of this curious creature of the great deeps—2850 to 3000 feet—now known, although the species may be fairly abundant in its dark habitat on the sea bottom. It was caught on an expedition of the U. S. Fish and Wildlife Service ship *Oregon*, and lives in perpetual darkness, well below sea depths penetrated by sunlight. One explanation for its peculiarities is that it represents a type, only two species of which are known, that has gone lower and lower to escape competition, and over the millenniums has lost some features characteristic of its group.

Bulletin

"Our Growing Water Problems" is a recent publication of the National Wildlife Federation, 232 Carroll Street, N. W., Washington 12, D. C. Written by R. G. Lynch of Milwaukee, Wisconsin, this booklet treats on a national scale the complex problems of managing public water resources for the diverse and conflicting needs of our rapidly expanding population. Single copies may be secured without charge from the Federation at the above address.

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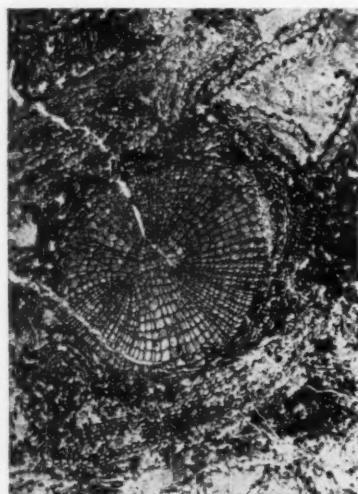
Nature AND THE MICROSCOPE

By JULIAN D. CORRINGTON

Coal Ball Peels

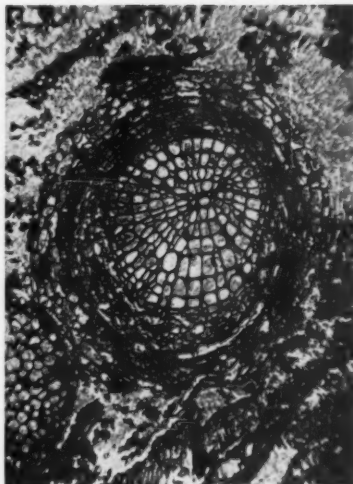
IT HAS LONG BEEN known that coal is formed from the remains of plants that lived ages ago. So important is this mineral to civilization and so diverse its numberless uses that most of the scientific research concerning it has centered around mining methods and the preparation of a fantastic number of by-products—chemicals, dyes, medicines, plastics—aside from the direct utilization of the coal itself.

From time to time recognizable fossils of some of the coal-forming plants or their parts have been found in mines, but as a rule these remains have been altered and compressed by the great heat and pressure that solidified the coal to such an extent that their structural features have disappeared. Modern strip mining has provided the geologist and paleobotanist with a new means of



Sphenophyllum plurifoliatum, c.s. stem. Paleozoic relative of horsetails and clubmosses.

obtaining good material, not from the coal beds, but from the layers of shale rock immediately overlaying them. Here, in the wake of the great electric shovels, one finds huge piles of discarded rocks that contain aggregations and nodules of plant remains, often in an excellent state of preservation.



Sphenophyllum plurifoliatum, c.s. root.

(PHOTO-MICROGRAPHS COURTESY OF FLATTERS & GARNETT, LTD.)

Coal balls, as one type of these accumulations is now called, can be sectioned in the same manner as rocks and minerals—a sawing, grinding, and polishing technique that laboriously prepares a slice thin enough to transmit light. Mounted on a microscope slide, such a section may be studied in the same manner as a section of present-day plant root or stem. See this Department in the issues for January and February, 1957, for full details as to how rocks and minerals are studied under the microscope, including the sectioning technique and a description of the polarizing microscope.

In a newer method, a peel is made from a desired portion of a coal ball by using collodion or other substance that will lift off a print of the surface to mount on a slide, somewhat as a fingerprint can be lifted from a door-knob by applying Scotch tape.

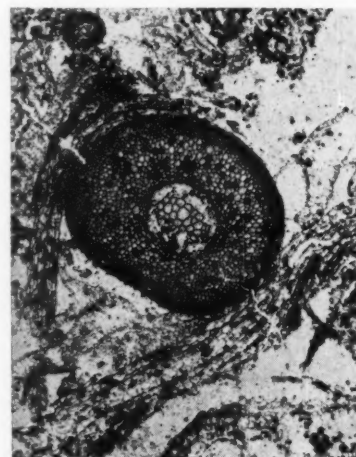
When one considers the great age of the original, the detail presented by one of these peel slides is truly amazing. The subjects have gone through innumerable vicissitudes, their substances replaced, molecule by molecule, by minerals in solution. Often there is a sort of natural staining imparted by the includ-



Stigmara ficoides, l.s., a lycopod.

ed solutions. The result of this combined work on the part of Nature and man is a finished slide of great beauty and value that, under the microscope, looks as if it had been prepared from material that was living and growing yesterday in the woodland or garden.

Most of the coal of the world was formed during a period of time from 275 million to 225 million years ago. This interval of 50 million years, so far back in the past as to stagger the imagination, is designated as the Pennsylvanian Period, an upper division of the Paleozoic; in Europe it is known as the Upper Carboniferous, of which the upper portion constitutes the Coal Measures. This was an age in which the climate was warm, moist, and uniform, conditions favoring the luxuriant growth of great swampy forests. Among terrestrial animals there were spiders,



Botryopteris tridentata, with small root, c.s., a fern.

scorpions, and insects, such as giant dragonflies, and also salamander-like amphibians, some of them very large by modern standards in this group. Reptiles, birds, and mammals had not yet evolved.

The Pennsylvanian landscape would have presented a curious and unfamiliar appearance to some imaginary time-traveler. There were tremendous forests of tall trees, up to a hundred feet in height, belonging to the plant groups of lycopods, horsetails, and a few gymnosperms. The remnant of lycopods living today are the diminutive club mosses and Christmas greens; horsetails are small and few; gymnosperms became the great array of pines, spruces, and their allies. Most of the Pennsylvanian plants, however, were ferns and a related group that died out, the seed ferns. True ferns reproduce by spores, but the seed ferns had real seeds and were probably the ancestors of all the higher seed plants. A great deal of our knowledge in this section of paleobotany has come from recent studies of coal balls and related fossils.

Our illustrations are photomicrographs from slides prepared in the laboratories of the well-known British firm, Flatters & Garnett, Ltd., of 309 Oxford Road, Manchester 13, England, and from them the interested reader may obtain a leaflet quoting slides and prices. The fossils illustrated were secured from the Lancashire coalfield, but the firm also stocks slides from other sources, including American ones. Identifications are made by the expert, J. Walton, professor at the University of Glasgow.

The Society Screw

By T. H. Mackintosh

Head, Photographic Laboratory
Carolina Biological Supply Company

A standard microscope objective can be screwed into place on any modern microscope stand. This simple act has been performed by all of us so many times that we accept it as "normal." The fact is that men now living can recall a time when the thread of a given nosepiece might or might not accept another maker's objective.

In the early 1800's microscopists were perfectly aware of the convenience and economy of interchangeable objectives if they could only be produced by the manufacturers. There was much discussion

of the lack of uniformity, and numerous attempts were made to correct the situation.

A century ago, in 1857, the Royal Microscopical Society of London decided that some solution to the problem must be found. The Society set up standards (which were published the following year) for a universal screw, which was shortly named "The Society Screw." To assure the manufacturers' adherence to the specifications, the Society produced standard taps for cutting the threads. Mechanical difficulties, however, intervened to defeat the project.

A quarter of a century passed. In 1884 the American Microscopical Society initiated a correspondence with the British group in the hope that by combining their efforts the universal screw might be perfected. Again, mechanical difficulties frustrated the attempt.

Finally, in 1896, the Royal Microscopical Society again plunged into the problem. Past mistakes were analyzed, and a most determined effort was made to solve all the various difficulties. One by one the obstacles were surmounted and final success was achieved. The Society set forth the complete specifications for the threads for objective and nosepiece, and their adoption was shortly all but universal. The Society Screw from that time on was the recognized standard.

Today every leading microscope maker in the world has accepted and uses the specifications for the Society Screw. All leading makes of objectives and nosepieces have threads well within the tolerances of the Society's standards (whose latest revision was published in the *Journal of the Society* for 1936, page 377).

The efforts expended in the project can be followed in an article by E. M. Nelson, "On the Origin of the Society Screw," in the *Society's Journal* for 1910 (page 443).

The story of the Society's work in producing the Society Screw, with illustrations and tables of specifications, can be found in the various editions of Simon H. Gage's work, *The Microscope*. A valuable and useful drawing of the threads showing the plus and minus dimensional tolerances has been included by Shillaber on page 23 of his book, *Photomicrography* (1944).

In this connection it is worth telling that three years ago our

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photomicrographic lab needed a metal member threaded to accept a standard objective. We provided a local machinist with Shillaber's book, and from the drawing he turned out the job in a couple of hours.

Today, if a microscope is set up for a given project, any objective in the lab can be instantly screwed into the nosepiece. It is difficult to exaggerate the convenience and practicality of such standardization. And now—if only a similar job could be done for the threads of machine screws as used on scientific instruments. (Reprinted by permission from Vol. XXI, No. 2, February, 1958, *Carolina Tips*, official house organ of the Carolina Biological Supply Company, Elon College, N. C.).

Optical Tricks

5. Variable Fingers

HOW MANY fingers do you have on your left hand? Five? Come now, that is a bit too commonplace! Some people have six as a genetic variation (polydactylism), although the surgeon usually removes the supernumerary digit early in life. Others have had unfortunate amputations. But we are talking about the normal number, and five is so very universal. Let us see if we can alter this situation.

Hold the left hand out in front of your eyes, palm toward the face,

about 18 inches distant, fingers pointing upward and spread apart. Relax the accommodation of the lenses of the eyes by looking at a distant object—something a hundred or more feet away. Count your fingers without shifting the accommodation. Well, that is better, is it not? Wiggle your fingers about and open and close them while looking through them.

It is easy to see that you now have seven, eight, or nine—sometimes more, sometimes less.

In the same position, hold up only the index and middle fingers, as if making the V sign for victory. Bring these two fingers together and then separate them widely. How many? At one point you can readily see four or, if the two apparent central

ones overlap, then you see three, making a very good W for Winston, who originated the V for Victory sign.

The explanation is simple. You are gazing at a distant object, or at infinity if completely relaxed. Each eye sees a given finger separately, more or less doubling their total number. The moment you shift the accommodation and gaze directly at the fingers, the illusion vanishes. Man has binocular vision as one of his most important assets, and when he looks directly at an object, the two eyes form a fusion image that shows rotundity and yields depth perception. If you will repeat the procedure with one eye closed, you will see only five fingers, no matter what the accommodation.

Seeing in the Dark

THE INGENUOUS instrument assembly pictured herewith is known as a Sniperscope M-2, and has many uses, including that of seeing in the dark without being seen. There is an infrared light source, a fluorescent screen for rendering visible the infrared images, and an image tube. Included are a semi-transparent photo-cathode sensitive to infrared, and an electron lens.

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The Edmund Sniperscope.

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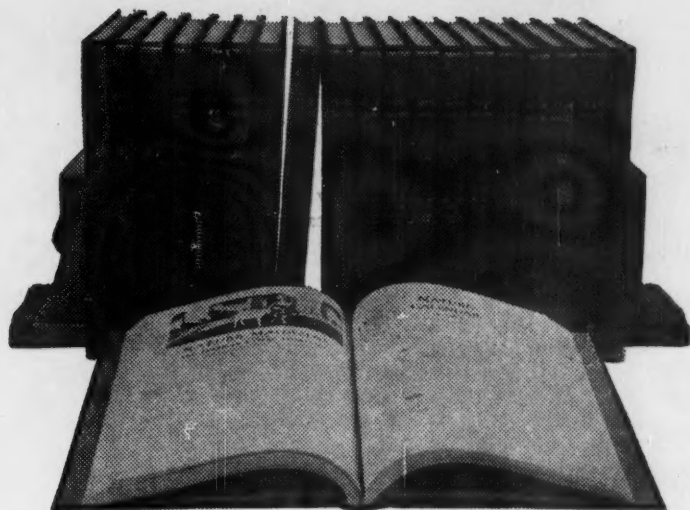
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